JOHN F. KENNEDY SPACE CENTER

SP-169-D
December 21, 1964

SATURN IB ELECTRICAL GROUND SUPPORT EQUIPMENT FOR LAUNCH COMPLEX 34

LAUNCH SUPPORT EQUIPMENT ENGINEERING DIVISION

JOHN F. KENNEDY SPACE CENTER

SP-169-D

SATURN IB ELECTRICAL GROUND SUPPORT EQUIPMENT FOR LAUNCH COMPLEX 34

TECHNICAL STAFF
LAUNCH SUPPORT EQUIPMENT ENGINEERING DIVISION

December 21, 1964

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Cont.)

GLOSSARY OF TERMS

AGCS	Automatic Ground Control Station
DE	Launch Equipment Branch
DL	Launcher-Transporter Systems Branch
DP	Propellant Systems Branch
ECS	Environmental Control System
EGSE	Electrical Ground Support Equipment
ESE	Electrical Support Equipment
GH_e	Gaseous Helium
GN_2	Gaseous Nitrogen
GOX	Gaseous Oxygen
H_e	Helium
J	Junction
KSC	Kennedy Space Center
LC-34	Launch Complex 34
LCC	Launch Control Center
LEM	Lunar Excursion Module
LH_2	Liquid Hydrogen
LN_2	Liquid Nitrogen
LOX	Liquid Oxygen
MSFC	Marshall Space Flight Center

GLOSSARY OF TERMS (Cont.)

PTCS	Propellant Tanking Computer System
RP-1	Rocket Propellant (refined kerosene)
TC	Thrust Chamber
UB	Umbilical

SECTION I
INTRODUCTION

1-1. PURPOSE

This document presents, locates, and describes the Saturn IB electrical ground support equipment (EGSE) that is under the design cognizance of the Launch Support Equipment Engineering Division for Launch Complex 34 (LC-34) as presently defined.

1-2. SCOPE

This document is limited to a description of the EGSE provided by, or under the design cognizance of, the Launch Support Equipment Engineering Division for LC-34, Eastern Test Range (ETR), Cape Kennedy, Florida. The design of much of the equipment described herein is not yet complete. This document therefore will be revised to reflect changes and modifications as they occur. In broad terms, however, the function and purpose of the systems and equipment described are not expected to change.

1-3. LAUNCH COMPLEX 34

LC-34 is located within the Eastern Test Range and provides the facilities and equipment necessary to receive, assemble, check out, and launch Saturn IB vehicles with their payloads. LC-34 consists of the following major categories of facilities or equipment:

a. Launch Pedestal
b. Automatic Ground Control Station (AGCS)
c. Umbilical Tower
d. Launch Control Center (LCC)
e. Propellant Facilities
f. High Pressure Gas Facilities

LC-34 is designed for fixed operation; that is, the vehicle is assembled and checked out on the launch pedestal at the launch pad. Assembly and service of the vehicle is accomplished through the use of a mechanized mobile tower and platform structure called the service structure. Assembled vehicle checkout and launch activity in the pad area are accomplished by the use of automatic checkout equipment that is located in the LCC.

The major items of equipment or facilities designed by the Launch Support Equipment Engineering Division for LC-34 to implement the Saturn IB program are:

a. Firing Accessories
b. Propellant Facilities
c. High Pressure Gas Facilities
d. Environmental Control Systems (ECS)

The general layout of the launch equipment electrical system for Saturn IB is presented in figure 1-1.

The launch equipment electrical system for Saturn IB on Launch Complex 37 (LC-37) is essentially the same as that on LC-34 except as indicated in figure 1-1. LC-37 does not have valve panels 2 and 4 and equipment locations are different from LC-34 in some instances. Electrical interconnect drawings are therefore different for the two complexes.

The location of the racks and other major launch equipment electrical items is presented in figure 1-2.

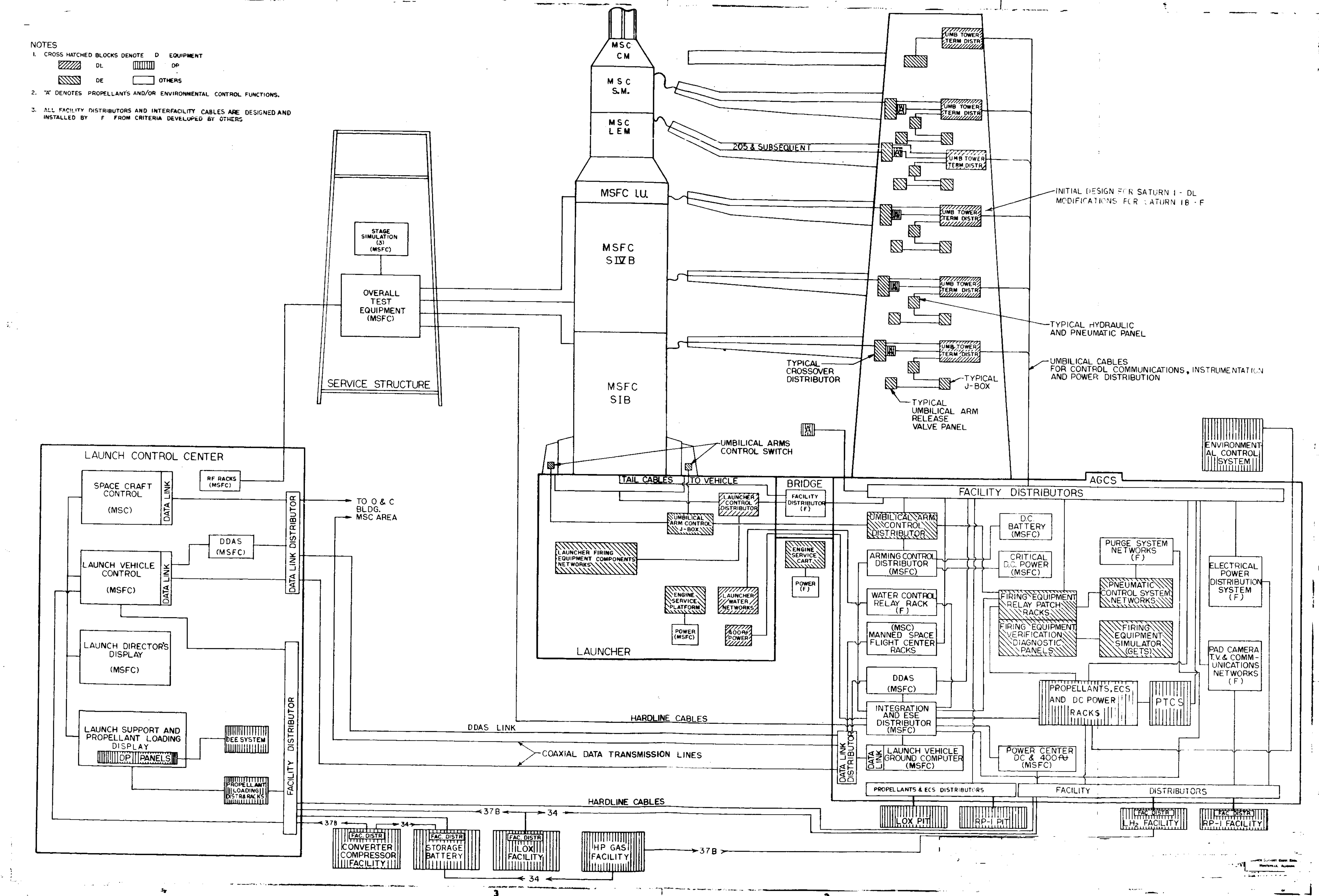


Figure 1-1. Block Diagram of Launch Equipment Electrical System for Saturn IB

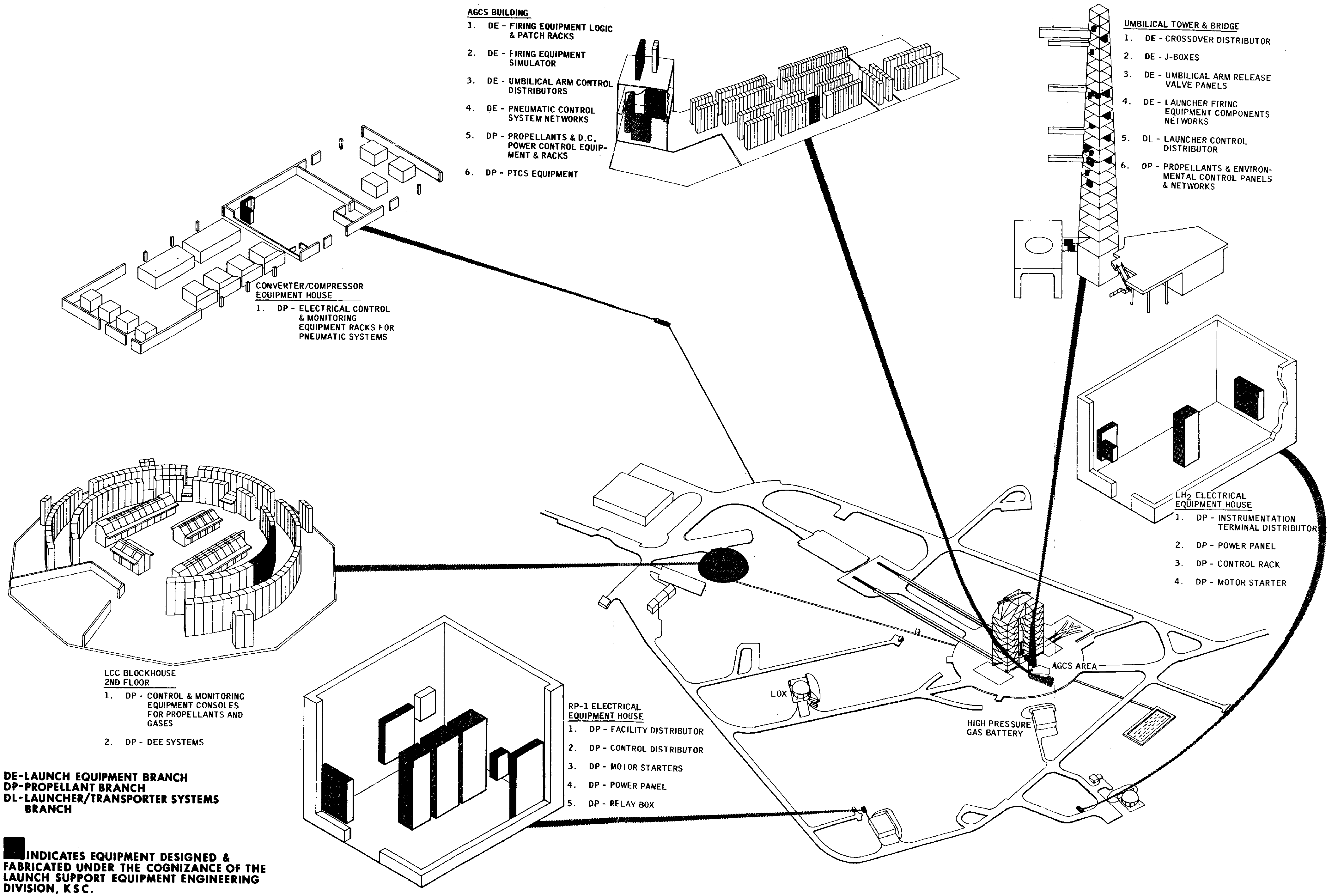


Figure 1-2. Launch Support Equipment Engineering Division Electrical Ground Support Equipment for Saturn IB - Launch Complex 34

SECTION II
FIRING ACCESSORIES AND GROUND ELECTRICAL NETWORKS

2-1. PNEUMATIC CONTROL SYSTEM

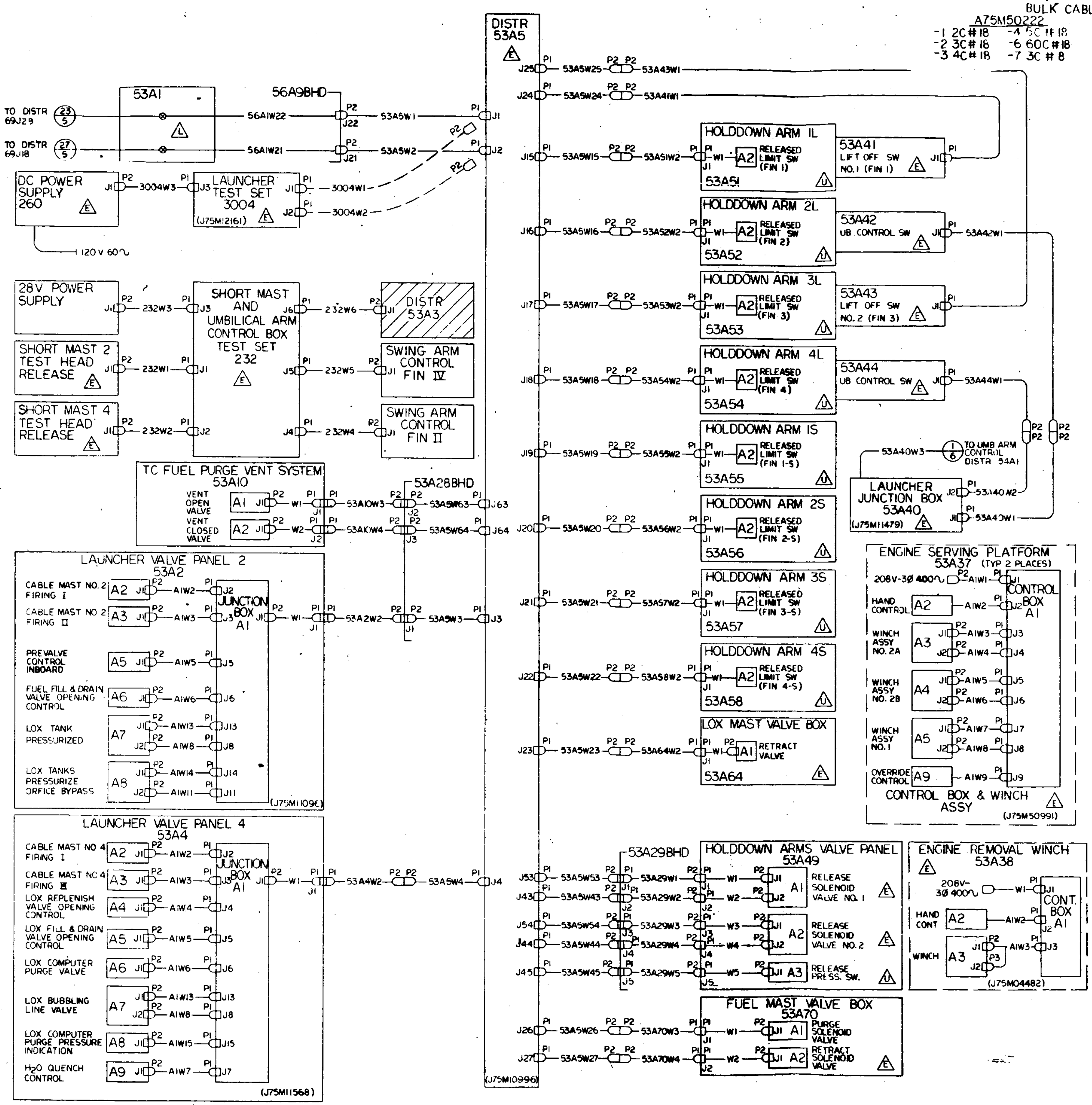
The pneumatic control system provides the control and monitor functions for the gaseous nitrogen (GN_2) and helium (H_e) systems at the launch pad. The control and monitor panels provided by Marshall Space Flight Center (MSFC) are located in the LCC blockhouse. The electrical interface of the MSFC panels and the Kennedy Space Center (KSC) pneumatic control distributors is relay distributors 55A1A1 and 55A1A2 in the first floor of the AGCS. Relay modules in the relay distributors in the AGCS provide the required logic for the controlling and monitoring functions for the pneumatic and hydraulic systems.

The following valve panels and components, located on the launch pedestal, are connected to distributor 69 in the AGCS by way of distributor 53A5, which is located on the bridge between the launch pedestal and the AGCS.

a. Thrust Chamber (TC) Fuel Purge Vent System - Launch Equipment Branch (DE)
b. Launch Valve Panels 2 and 4 - (DE)
c. Holddown Arms Valve Panel - Launcher-Transporter Systems Branch (DL)
d. Fuel Mast Valve Box - (DE)
e. Holddown Arms Released Limit Switches (Fins 1 through 4 and Fins 1-S through 4-S) - DL
f. Liquid Oxygen (LOX) Mast Valve Box - DE
g. Launcher Junction Box - DE
h. Engine Servicing Platform - DE
i. Engine Removal Winch - DE
j. Lift-Off Switches (Fins 1 and 3) - DE
k. UB Control Box - DE

The cables between this listed equipment and the junction (J) boxes and the cables between distributor 53A5 and facility distributor 69 are designed and provided by DE. The cable interconnect drawing is presented in figure 2-1.

Pneumatic control distributors 55A10A1 and 55A10A2 interconnect with the various GN_2 components, transducers, and valve panels. Pneumatic control distributors 55A10A3 and 55A10A4 interconnect with the various H_e system components, transducers, and valve panels located in the first floor of the AGCS. Distributors 55A10A1 through 55A10A4 provide the interconnect between the end items and relay distributor 55A1A2. Relay distributor 55A1A2 contains the relay modules that perform the DE logic functions; this distributor also serves



BULK CABLE CODE

A75M50222		A75M50223
-1 2C#18	-4 5C #18	-7 60C #20
-2 3C#16	-6 60C#18	
-3 4C#18	-7 3C #8	

REF DES	CABLE ASSY	CABLE SUB-ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
53A2W1	D75M10816 -1	D75M50712 -3.0	A75M50222 -6	10-323640 -53P	CA22512 -1(S)	DE
53A2W2	D75M11757 -17	D75M50708 -20	-6	10-323640 -53S	10-323640 -53P	
53A2A1W2,3 5,6	D75M10816 -2,3 -5,6	D75M50402 -7.0, 7.0,5.5,7.0	-3	MS3106R14S-2P	MS3106R14S -2S	
53A2A1W8,11	-7,8	D75M06581-4.0,4.5	-2	MS3106R14S-7P	MS3106R10SL-3S	
53A2A1W13,14	D75M10816 -9,10	D75M50401-3.5,4.5	-1	MS3106R14S-9P	MS3106R10SL-4S	
53A4W1	D75M10815 -1	D75M50712 -	-6	10-323640 -53P	CA22512 -1(S)	
53A4W2	D75M11757 -18	D75M11758 -28	-6	10 323640 -53S	10-323940 -53P	
53A4A1W2,3,4 5,6	D75M10815 -2,3,4 5,6	D75M50402 -	-3	MS3106R14S-2P	MS3106R14S -2S	
53A4A1W7	-10	D75M50402 -10	-3	-2P	MS3106R14S -2S	
53A4A1W8	-7	D75M50403 -	-2	-7P	MS3106R14S -3S	
53A4A1W13	-8	D75M50401 -	-1	-9P	MS3106R10SL-4S	
53A4A1W15	D75M10815 -9	D75M50722 -	-5	MS3106R14S-6P	-6S	
53A5W1, 2	D75M11756 -25,26	D75M50907 -25	-6	10-323640 -53S	CA22511 -0(P)	
53A5W3,4	-1,2	D75M50708 -14,80	-6	10-323640 -53P	10-323640 -53S	
53A5W15 16 17,18,19	-3,4 -5,6,7	D75M50402-46,34 51,67,35	-3	MS3106R14S-2P	MS3106R14S -2S	
53A5W20,21, 22,23	-8,9. 10,11	-41,62 D75M50402-54,47	-3	-2P	MS3106R14S -2S	
53A5W24 25	-12,13	D75M04019 -47,51	-3	-2P	MS3101R14S -2S	
53A5W26,27	-14,15	D75M50402 -38	-3	-2P	-2S	
53A5W43,44, 45	-16,17, -18	D75M50404 -12	-2	-7P	-7S	
53A5W53,54	-19,20	D75M50897 -12	-1	-9P	-9S	
53A5W63,64	D75M11756 -23,24	D75M03348 -14	-4	-5P	-5S	
53A10W1, 2	D75M12071 -1,2	D75M03348 -2	-4	-5P	-5S	
53A10W3,4	D75M11757 -19,20	D75M03348 -44	-4	-5S	MS3101R14S -5P	
53A29W1	-12	D75M50401 -6	-1	-9P	MS3106R10SL-4S	
53A29W2	-13	D75M50403 -6	-2	-7P	-3S	
53A29W3	-14	D75M50401 -6	-1	-9P	-4S	
53A29W4	-15	D75M50403 -6	-2	-7P	MS3106R10SL-3S	
53A29W5	D75M11757 -16	D75M50404 -6	A75M50222 -2	MS3106R14S-7P	MS3106R14S -7S	
53A37A1W1	D75M51039 -1	D75M51054 -50		MS3106E-32-17S	4268 BC	
53A37A1W2					RUSSELL & STOLL	
53A37A1W3	D75M51039 -2	D75M51037 -10		MS3106E-20-4P	MS3106E-20-4S	
53A37A1W4	D75M51039 -5	D75M50402 -7		MS3106R14S -2P	MS3106R14S -2S	
53A37A1W5	D75M51039 -3	D75M51037 -6		MS3106R-20-4P	MS3106R-20-4S	
53A37A1W6						
53A37A1W7	D75M51039 -4	D75M51037 -6		MS3106E-20-4P	MS3106E-20-4S	
53A37A1W8						
53A37A1W9						
53A38W1						
53A38A1W2						
53A38A1W3						
53A40W1,2	D75M11756 -21,22	D75M50899-34,67	SS TUBING RT-7A HOSE	MS3106R14S-2P	MS3101R14S -2S	
53A40W3			7C#10 MI			
53A41W1	D75M02970 -5	D75M06858 -14	#16 WIRE	MS3108E14S -2S	MS3106E14S -2P	
53A42W	-6	-14		-2S	-2P	
53A43W	-7	-14		-2S	-2P	
53A44W1	D75M02970 -8	D75M06858 -14	#16 WIRE	MS3108E14S -2S	MS3106E14S -2P	
53A49W1						
53A49W2						
53A49W3						
53A49W4						
53A49W5						
53A51W1						
53A51W2	D75M11757 -3	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A52W1						
53A52W2	D75M11757 -4	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A53W1						
53A53W2	D75M11757 -5	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A54W1						
53A54W2	D75M11757 -6	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A55W1						
53A55W2	D75M11757 -7	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A56W1						
53A56W2	D75M11757 -8	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A57W1						
53A57W2	D75M11757 -9	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A58W1						
53A58W2	D75M11757 -10	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A64W1	D75M50730 -1	D75M50909 -1	A75M50222 -3	BFR-14S-2P-1	MS3106R14S -2S	
53A64W2	D75M11757 -11	D75M50900 -14	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
53A70W1	D75M50732 -1	D75M50911 -1	A75M50222 -3	BFR-14S-2P-1	MS3106R14S -2S	
53A70W2	D75M50732 -2	D75M50909 -1	A75M50222 -3	BFR-14S-2P-1	MS3106R14S -2S	
53A70W3,4	D75M11757 -1,2	D75M50900 -8	A75M50222 -3	MS3106R14S-2S	MS3101R14S -2P	
56A1W21						
56A1W22						
232W1,2	75M05573 -1,2	D75M50402 -100	A75M50222 -3	MS3106R14S-2P	MS3106R14S -2S	
232W3	75M05573 -3	D75M50499 -40	3C#16 TYPE SO	MS3106R14S-7S	MS3106R22S-2P	
232W4,5,6	75M05573 -4,5,6	D75M50401 -100	A75M50222 -1	MS3106R14S-9P	MS3106R10SL-4S	
3004W1,2	-------	D75M09894 -30	A75M50223 -7	PT06P-24-61P	10-323640 -53S	
3004W3	-------	D75M50238 -10	A75M50222 -7	MS3106R 22-2P	MS3106R 22-2S	DE

LAUNCHER

Figure 2-1. Cable Interconnect Drawing, Distributor 53A5 and Facility Distributor 69 as the interconnects between the KSC equipment and networks and the dc power and AGCS electrical integration patch racks that are provided by MSFC. The electrical cables between the end items, pneumatic control distributors, the relay distributor, and the MSFC patch rack and dc power panel are designed and provided by DE. The cable interconnect drawing is presented in figure 2-2.

High-pressure distributor 59A4 is located in the first floor of the AGCS and provides the electrical interconnect between the high-pressure GN_2 and H_e supply system and components at the pad storage area and relay distributor 55A1A2. J box 59A1A1 serves as the interconnect between relay distributor 55A1A1 and the hydraulic cart electrical system and certain monitoring functions related to the hydraulic system. The cables between the end items, the high-pressure distributor and the relay distributor and J box 59A1A1 are designed and provided by DE. The electrical interconnect drawing is presented in figure 2-3.

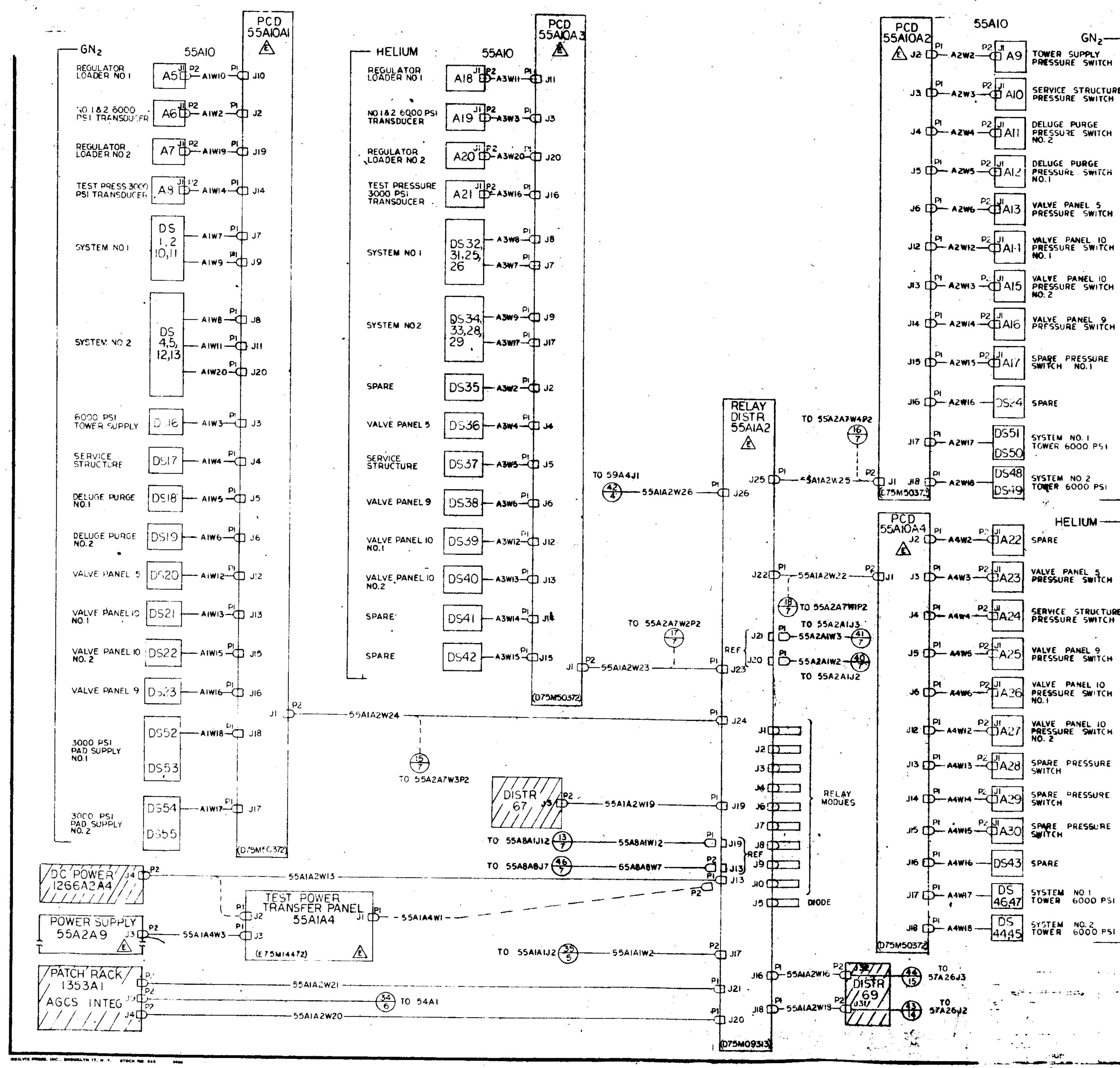
Relay distributor 55A1A1, located in the first floor of the AGCS, provides the interconnect between the propellants systems, the facilities equipment, the MSFC dc power distributor, and the DE electrical networks on the umbilical tower by way of facility distributor 69 and the umbilical distributors on the umbilical tower. It also contains the DE relay and diode modules that provide the logic and transfer functions for the DE electrical equipment on the umbilical tower. In the same area, and interconnected with relay distributor 55A1A1, are the DE checkout racks 55A2 and 55A8. Checkout rack 55A2 contains the following panels:

a. DE Power Supply
b. Power Panel
c. Pneumatic Control Distributor
d. Valve Panel No. 5
e. Valve Panel No. 10
f. Launcher Panel
g. Checkout Distributor

Checkout rack 55A8 contains the following panels:

a. Power Panel
b. Apollo Access Arm Panel
c. Valve Panel No. 9
d. Umbilical Arm Accumulator Charging Panel
e. Umbilical Arm Panel
f. Checkout Distributor

The cabling between the checkout racks and relay distributor is designed and provided by DE.



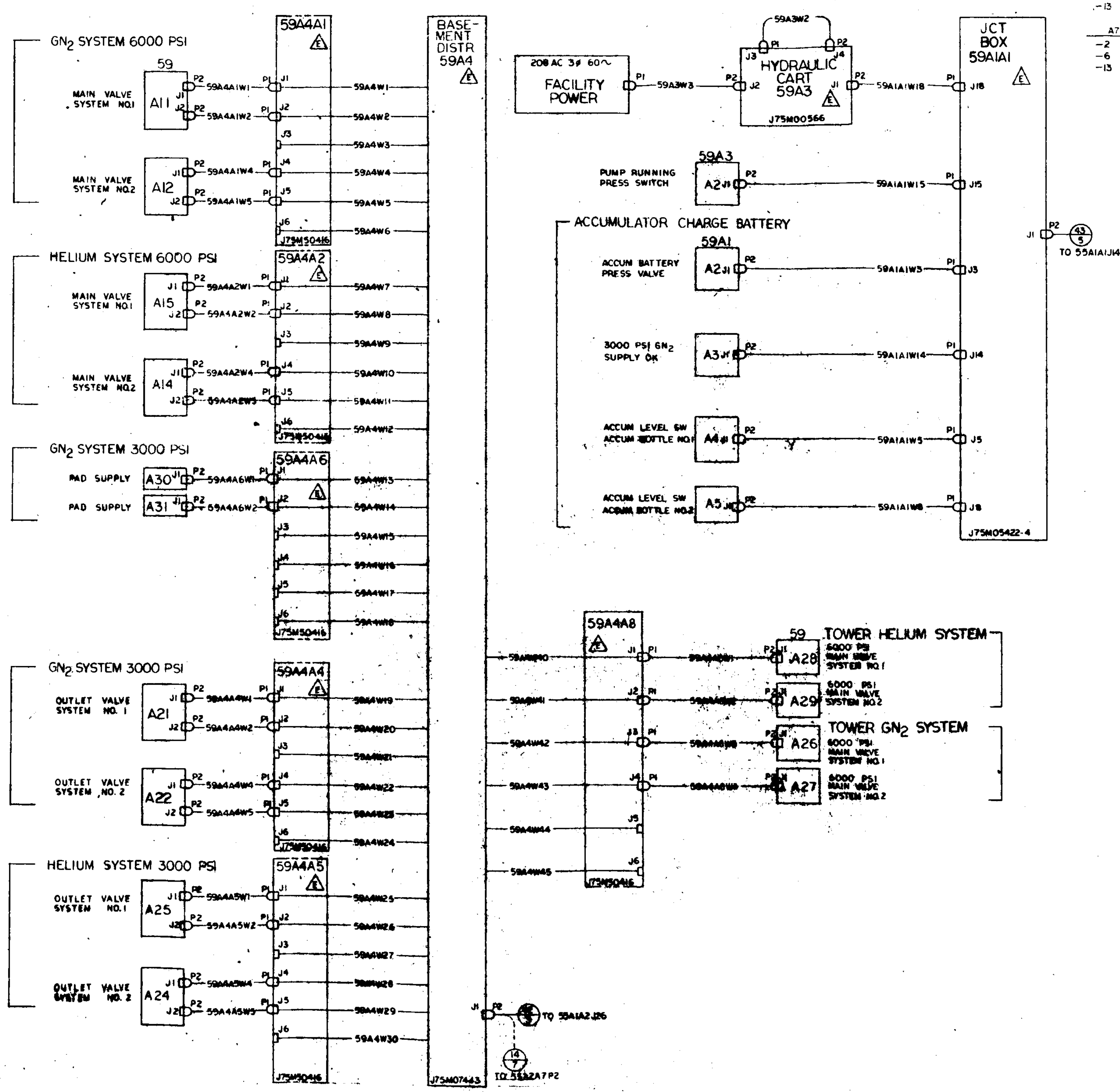
BULK CABLE CODE
75M50222
-1 2C#18
-2 3C#18
-3 4C#18
-7 3C#8

A75M50223
-2 3C#20
8 61C#20

REF DES	CABLE ASSY	CABLE SUB-ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
55A1A1W2	D75M13819-2	D75M50438-3	A75M50223-8	PT06P-24-61S-343	PT06P-24-61S-343	DE
55A1A2W13						ASTR
55A1A2W16,18	D75M13820-16,18	D75M50438-35	A75M50223-8	PT06P-24-61S-343	PT06P-24-61S-343	DE
55A1A2W19						ASTR
55A1A2W20						ASTR
55A1A2W21						ASTR
55A1A2W22,23	D75M13820-22,23	D75M50438-38,41	A75M50223-8	PT06P-24-61S-343	PT06P-24-61S-343	DE
55A1A2W24,25	D75M13820 24,25	D75M50438-37,33	A75M50223-8	PT06P-24-61S-343	PT06P-24-61S-343	
55A1A2W26	D75M13820-26	D75M50438-85	A75M50223-8	PT06P-24-61S-343	PT06P-24-61S-343	
55A1A4W1	D75M50437-8		A75M50223-8	PT06P-24-61P-343	PT06P-24-61S-343	
55A1A4W3	D75M05074-16		A75M50222-7	MS3106R22-2S	MS3106R22-2P	
55A2A1W2,3	D75M14093-2,3	D75M50437-10	A75M50223-8	PT06P-24-61P-343	PT06P-24-61S-343	DE
55A2A8W12						ASTR
55A10A1W2	D75M50419-25	D75M50404-3	A75M50222-2	MS3106R14S-7P	MS3106R14S-7S	DE.
55A10A1W3,4	D75M50419-10,11	D75M50408-13,12	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A1W5,6	D75M50419-12,13	D75M50408-12	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A1W7,8	D75M50419-21,22	D75M50407-4,8	A75M50222-3	MS3106R14S-2P	PIGTAIL	
55A10A1W9	D75M50419-19	D75M50407-2	A75M50222-3	MS3106R14S-2P	PIGTAIL	
55A10A1W10	D75M50419-26	D75M50401-3	A75M50222-1	MS3106R14S-9P	MS3106R10SL-4S	
55A10A1W11	D75M50419-28	D75M50406-3	A75M50222-1	MS3106R14S-9P	PIGTAIL	
55A10A1W12,13	D75M50419-14,15	D75M50408-10,9	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A1W14	D75M50419-24	D75M50404-3	A75M50222-2	MS3106R14S-7P	MS3106R14S-7S	
55A10A1W15,16	D75M50419-16,17	D75M50408-9,8	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A1W17,18	D75M50419-23,20	D75M50407-6,3	A75M50222-3	MS3106R14S-2P	PIGTAIL	
55A10A1W19	D75M50419-27	D75M50401-3	A75M50222-1	MS3106R14S-9P	MS3106R10SL-4S	
55A10A1W20	D75M50419-29	D75M50406-4	A75M50222-1	MS3106R14S-9P	PIGTAIL	
55A10A2W2,3	D75M50419-1,2	D75M50405-9,10	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A2W4,5	D75M50419-3,4	D75M50405-11,10	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A2W6,12	D75M50419-5,6	D75M50405-10,8	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A2W13,14	D75M50419-7,8	D75M50405-8,7	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A2W15	D75M50419-9	D75M50405-7	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A2W16	D75M50419-18	D75M50408-6	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A2W17,18	D75M50419-30,31	D75M50407-6	A75M50222-3	MS3106R14S-2P	PIGTAIL	
55A10A3W2	D75M50420-10	D75M50408-13	A75M50222-2	MS3106R14S		
55A10A3W3	D75M50420-23	D75M50404-3	A75M50222-2	MS3106R14S-7P	MS3106R14S-7S	
55A10A3W4,5	D75M50420-11,12	D75M50408-12	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A3W6	D75M50420-13	D75M50408-11	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A3W7,8	D75M50420-21,19	D75M50407-4,2	A75M50222-3	MS3106R14S-2P	PIGTAIL	
55A10A3W9	D75M50420-20	D75M50407-2	A75M50222-3	MS3106R14S-2P	PIGTAIL	
55A10A3W11	D75M50420-25	D75M50401-3	A75M50222-1	MS3106R14S-9P	MS3106R10SL-4S	
55A10A3W12,13	D75M50420-14,15	D75M50408-10,9	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A3W14,15	D75M50420-16,17	D75M50408-9,8	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A3W16	D75M50420-24	D75M50404-3	A75M50222-2	MS3106R14S-7P	MS3106R14S-7P	
55A10A3W17	D75M50420-22	D75M50407-5	A75M50222-3	MS3106R14S-2P	PIGTAIL	
55A10A3W20	D75M50420-26	D75M50401-4	A75M50222-1	MS3106R14S-9P	MS3106R10SL-4S	
55A10A4W2,3	D75M50420-1,2	D75M50405-9,10	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A4W4,5	D75M50420-3,4	D75M50405-11,10	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A4W6,12	D75M50420-5,6	D75M50405-10,8	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A4W13,14	D75M50420-7,8	D75M50405-8,7	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A4W15	D75M50420-9	D75M50405-7	A75M50223-2	MS3106R14S-7P	PT06P-8-3S-343	
55A10A4W16	D75M50420-18	D75M50408-6	A75M50222-2	MS3106R14S-7P	PIGTAIL	
55A10A4W17,18	D75M50420-27,28	D75M50407-6	A75M50222-3	MS3106R14S-2P	PIGTAIL	DE

PCD & TEST POWER TRANS. PANEL

Figure 2-2. Cable Interconnect Drawing, Distributor 55A10A1 Through 55A10A4



BULK CABLE KEY

A75M50222	
-2	3C#18
-3	4C#18
-5	6C#18
-13	4C#12

A75M50223	
-2	3C#20
-6	10C#20
-13	6C#20

REF DES	CABLE ASSY	CABLE SUB-ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
59A1A1W3	D75M13662-1	D75M50402-2	A75M50222-3	MS3106R14S-2P	MS3106R14S-2S	DE
59A1A1W5-8	D75M13662-3-4	D75M50403-2	A75M50222-2	MS3106R14S-7P	MS3106R-10SL-3S	
59A1A1W14	D75M13662-2	D75M50403-2	A75M50222-2	MS3106R14S-7P	MS3106R-10SL-3S	
59A1A1W15	D75M05111-4	D75M50403-6	A75M50222-2	MS3106R14 - 7P	MS3106R-10SL-3S	
59A1A1W18	D75M05111-3	D75M13808-13	A75M50223-13	MS3106R14 - 6P	MS3106R18-1S	
59A3W2	D75M03114	2FT 10C#20	A75M50223-6	MS3106E-18-1S	MS3106E-18-1P	
59A3W3	D75M03128	30FT 4C# 12	A75M50222-13	3118W	MS3106E-18-10S	
59A4W1-2	D75M14095-1-2	D75M50415-26	A75M50223-2	MS3100R14S-7S	PIGTAIL	
59A4W3-4	-3-4	-26	-2	-7S		
59A4W5-6	-5-6	-26	-2	-7S		
59A4W7-8	-7-8	-23	-2	-7S		
59A4W9-10	-9-10	-23	-2	-7S		
59A4W11-12	-11-12	D75M50415-23	-2	-7S		
59A4W13-14	-13-14	D75M14107-23	-13	-6S		
59A4W15-16	-15-16	D75M14107-23	-13	-6S		
59A4W17-18	-17-18	D75M14107-23	-13	-6S		
59A4W19-20	-19-20	D75M50415-25	-2	-7S		
59A4W21-22	-21-22	-25	-2	-7S		
59A4W23-24	-23-24	-25	-2	-7S		
59A4W25-26	-25-26	-21	-2	-7S		
59A4W27-28	-27-28	-21	-2	-7S		
59A4W29-30	-29-30	D75M50415-21	-2	-7S		
59A4W40-41	-40-41	D75M14107-33	-13	-6S		
59A4W42-43	-42-43	D75M14107-33	-13	-6S		
59A4W44-45	D75M14095-44-45	D75M14107-33	A75M50223-13	MS3100R14S-6S	PIGTAIL	
59A4A1W1-2	D75M13821-1-2	D75M50404-5-6	A75M50222-2	MS3106R14S-7P	MS3106R14S-7S	
59A4A1W4-5	-4-5	-6-7	-2	-7P	-7S	
59A4A2W1-2	-7-8	-6-7	-2	-7P	-7S	
59A4A2W4-5	-10-11	-5-6	-2	-7P	-7S	
59A4A4W1-2	-19-20	-2	-2	-7P	-7S	
59A4A4W4-5	-22-23	-4	-2	-7P	-7S	
59A4A5W1-2	-25-26	-4	-2	-7P	-7S	
59A4A5W4-5	-28-29	D75M50404-4	-2	-7P	-7S	
59A4A6W1-2	-31-32	D75M50722-3	-5	-6P	-6S	
59A4A8W1-2	-43-44	-2	-5	-6P	-6S	
59A4A8W3-4	D75M13821-45-46	D75M50722-3-4	A75M50222-5	MS3106R14S-6P	MS3106R14S-6S	DE

AGCS BASEMENT

Figure 2-3. Electrical Interconnect Drawing, High Pressure Distributor 59A4

2-2. UMBILICAL SERVICE ARMS

Four umbilical service arms are situated on the LC-34 umbilical tower; these arms service the following positions on the Saturn IB vehicle:

a. SI Booster Stage
b. S-IVB Stage - Aft
c. S-IVB Stage - Forward and Instrument Unit
d. Apollo Service Module

The service arms carry the propellant servicing lines and the electrical power control and monitoring cables from the umbilical tower to the various vehicle stages.

Service arm retraction is initiated through two lift-off switches located on holddown arms, number 2 and number 4. An arming command provided by the automatic launch sequence program energizes the appropriate dc bus in distributor 54A1, providing 28-vdc power to the two identical switches for redundancy and reliability. As the vehicle rises, the lift-off switches close, energizing two parallel latching relays that actuate the valves through the appropriate circuits which execute retraction of the service arms. The umbilical arms monitoring panels are located in the LCC. They are designed and provided by MSFC. Design criteria are obtained from DE.

The cabling in the following areas is designed and provided by DE:

a. From the UB distributors to the crossover distributors and then from the crossover distributors to the vehicle at each service arm location except at the Apollo service module

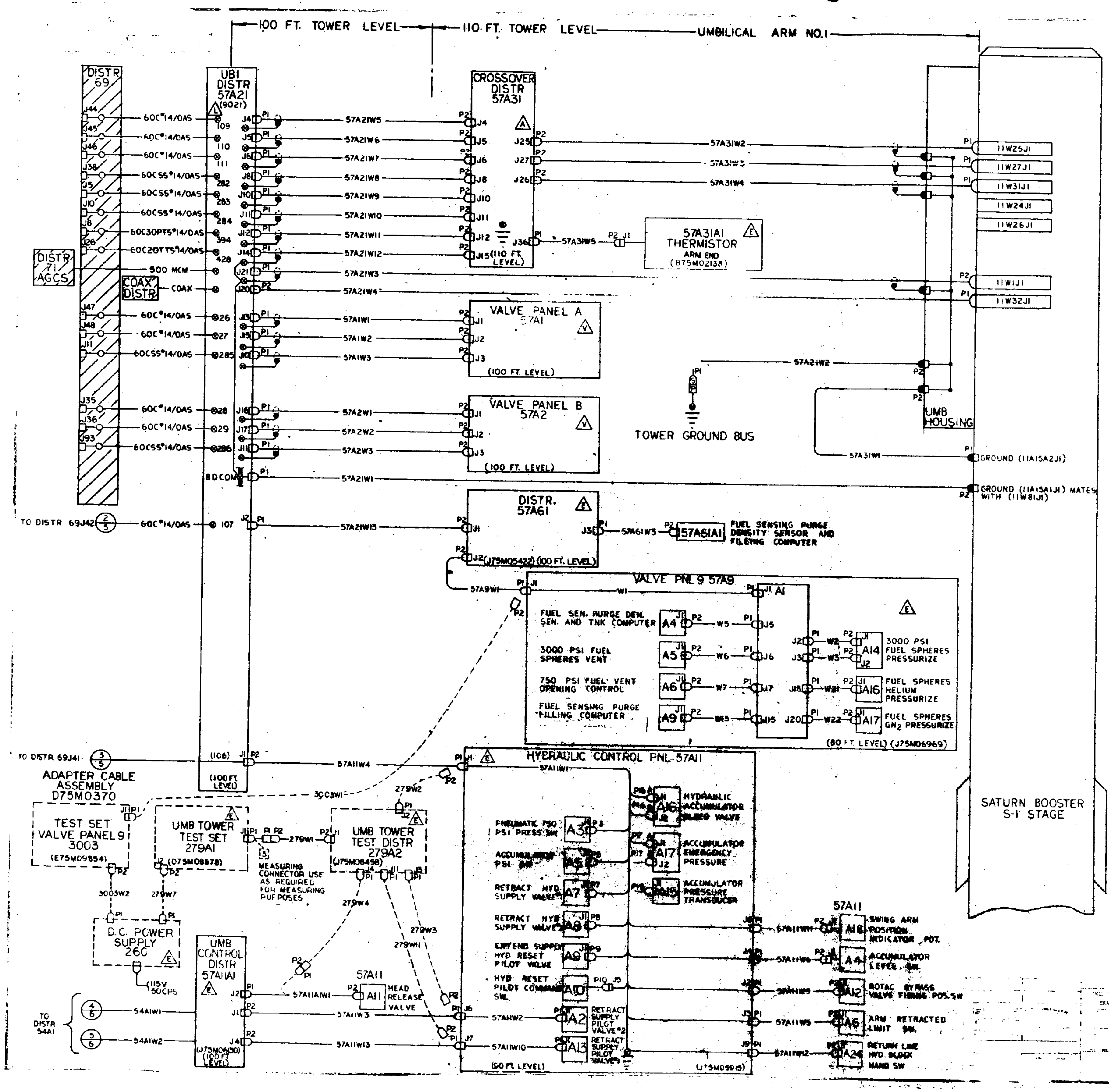
b. From the UB distributor to the DE valve panels and hydraulic control panel at, or adjacent to, each service arm tower level

Cable interconnect diagrams for the umbilical service arms are presented in figures 2-4 through 2-7.

2-3. APOLLO ACCESS ARM

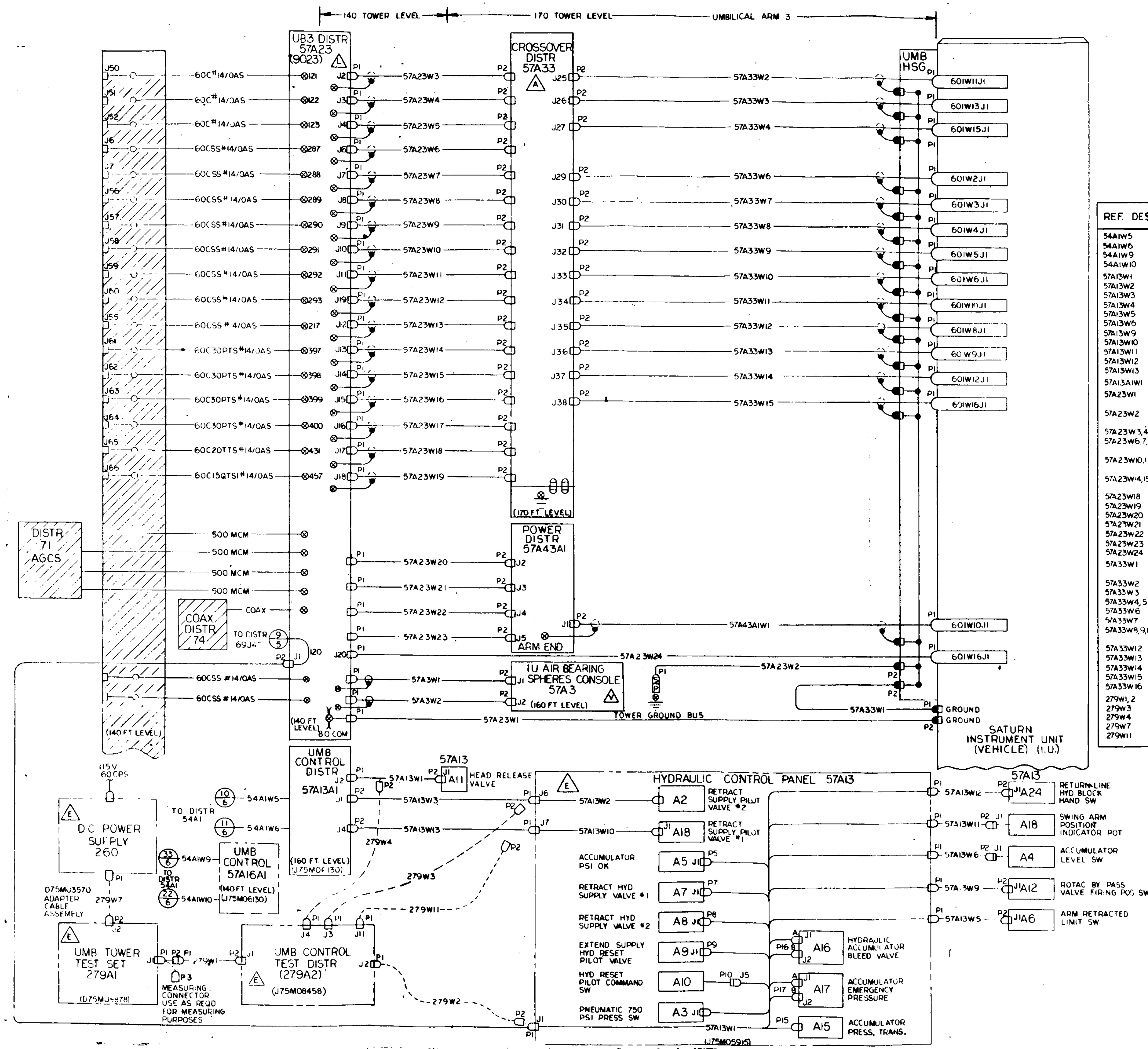
The Apollo access arm is retracted by way of a command from a control panel in the LCC. The arm is retracted at approximately T-20 in the countdown. The system is designed so that the access arm may be returned to the extended position to permit egress from the Apollo command module in an emergency condition or an abort.

Required cables to the environmental chamber, pneumatic equipment box, Apollo gaseous oxygen (GOX) module, and the hydraulic control panel at



REF DES	CABLE ASSY	CABLE SUB-ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
57A21W1	D75M11311-2	D75M06861-E5	MIL-W-5086	SOCKET PLUG *FS50GB	BANANA PLUG BIRNBACH 398	DE
57A21W2	D75M11311-3	D75M06860-85	MIL-W-5086	SOCKET PLUG *FS5066N	BANANA PLUG BIRNBACH 398	DE
57A21W3	D75M11311-4	D75M14041-85	A75M10200	10-323640-75	CA2252C-5(P)	DE
57A21W4	D75M11311-5	D75M50679-92	A75M50222-12	CS3106A40-67S	UG-627A/U	DE
57A21W5	D75M13459-8	D75M13747	A75M10191	10-323640-85P	10-323640-63S	DE
57A21W6	D75M13459-9	D75M13747	A75M10191	10-323640-85P	10-323640-63S	DE
57A21W7	D75M13459-10	D75M13747	A75M10191	10-323640-85P	10-323640-63S	DE
57A21W8	D75M13459-11	D75M13748	A75M10192	10-323640-85P	10-323640-63S	DE
57A21W9	D75M13459-12	D75M13748	A75M10192	10-323640-85P	10-323640-63S	DE
57A21W10	D75M13459-13	D75M13748	A75M10192	10-323640-85P	10-323640-63S	DE
57A21W11	D75M13459-14	D75M13749	A75M10193	10-323640-85P	10-323640-63S	DE
57A21W12	D75M13459-15	D75M13750	A75M10194	10-32364-85P	10-323640-63S	DE
57A21W13	D75M13459-16	D75M50712	A75M50222-6	10-3.364-53P	CA22512-1(S)	DE
57A31W1	D75M11311-6	D75M06030-4	MIL-W-5086	BANANA PLUG BIRNBACH 398	BANANA PLUG BIRNBACH 398	DE
57A31W2	D75M11311-7	D75M12112-64	A75M10192	CA22511-23(P)	10-323640-63S	DE
57A31W3	D75M11311-8	D75M13645-65	A75M10188	CA22511-23(P)	10-323640-63S	DE
57A31W4	D75M11311-9	D75M12112-64	A75M10192	CA22511-23(P)	10-323640-63S	DE
57A31W5	D75M11311-10	D75M504108-69	A75M50222-15	10-323617-61S	MS3106R16S-1S	DE
57A61W3	D75M11311-11	D75M50402-76	A75M50222-3	MS3106R14S-2P	MS3106R14S-2S	DE
279W1	D75M03417-1	D75M03416-6	A75M50223-7	CA22511-0(P)	CA22512-1(S)	DE
279W2	D75M03417-2	D75M03416-30	A75M50223-7	CA22511-0(P)	CA22512-1(S)	DE
279W3	D75M03417-3	D75M03418-30	A75M50222-3	MS3106E14S-2P	MS3106E14S-2S	DE
279W4	D75M03417-4	D75M04019-15	A75M50222-3	MS3106E14S-2P	MS3101E14S-2S	DE
279W7	D75M03417-7	D75M03419-10	TYPE SO	MS3106E22-2P	MS3106E14S-7S	DE
279W11	D75M03417-11	D75M50402-30	A75M50222-3	MS3106R14S-2P	MS3106R14S-2S	DE
3003W1						
3003W2						

Figure 2-4. Cable Interconnect Diagram, Umbilical Service Arm, Number 1

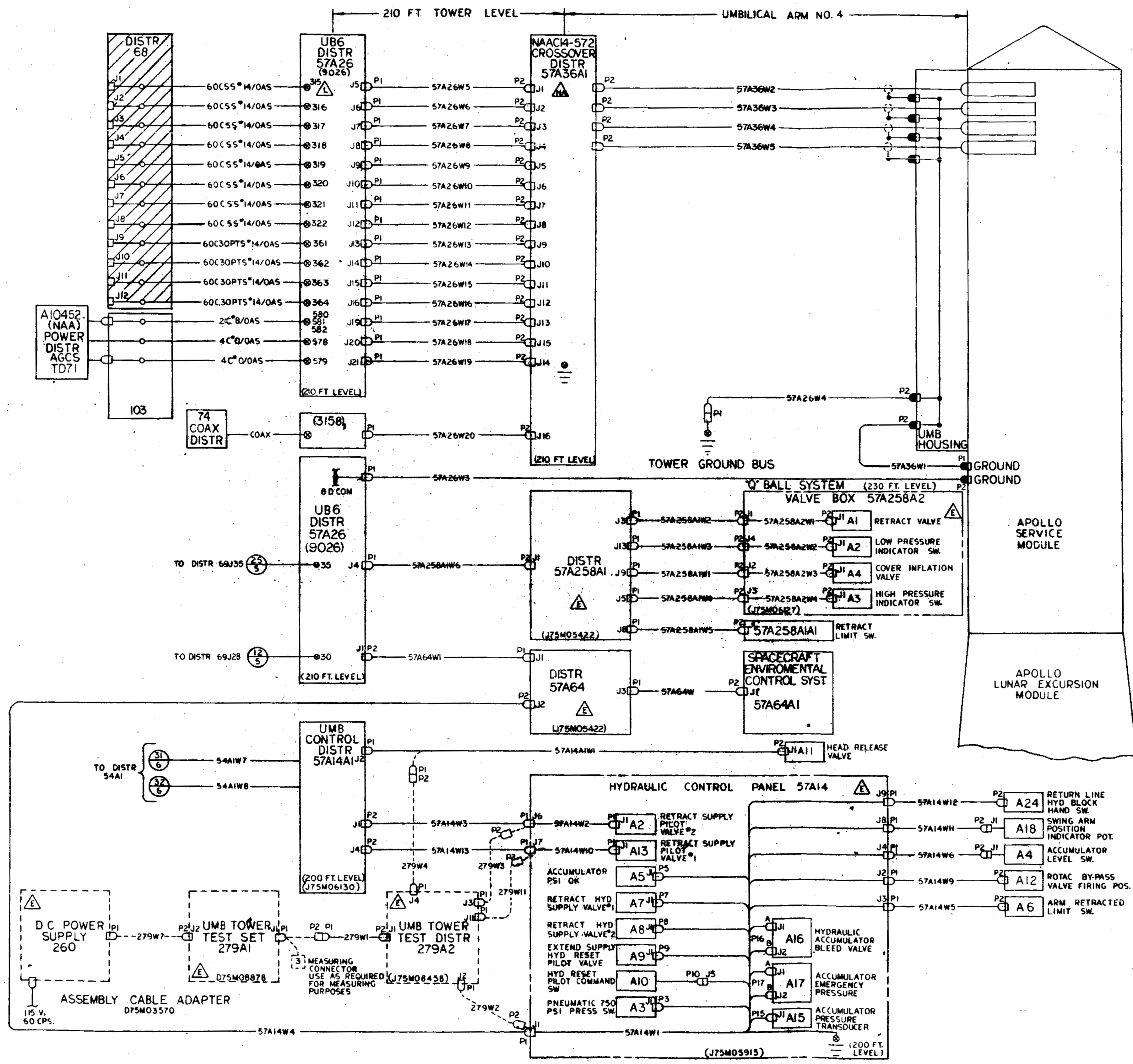


BULK CABLE CODE
A75M50222
-2 3C#18
-3 4C#18
-6 60C#18
A75M50223
-7 60C#20

REF. DES.	CABLE ASSY	CABLE SUB-ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN. BY
54A1W5	---------	---------	7C#10 M1	---------	---------	DE
54A1W6	---------	---------		---------	---------	
54A1W9	---------	---------		---------	---------	
54A1W10	---------	---------	7C#10 M1	---------	---------	
57A13W1						
57A13W2						
57A13W3	D75M13461-1	D75M50402	A75M50222-3	MS3106R14S-2S	MS3106R14S-2P	
57A13W4	D75M13461-2	D75M50712	A75M50222-6	CA22512-1(S)	10-323640-53P	
57A13W5	D75M13461-3	D75M03511	A75M50222-2	MS3106R10SL-3P	MS3106R14S-7S	
57A13W6						
57A13W9	D75M13461-4	D75M03511	A75M50222-2	MS3106R10SL-3P	MS3106R14S-7S	
57A13W10						
57A13W11	D75M13461-5	D75M03511	A75M50222-2	MS3106R10SL-3P	MS3106R14S-7S	
57A13W12	D75M13461-6	D75M30404	A75M50222-2	MS3106R14S-7P	MS3106R14S-7S	
57A13W13	D75M13461-7	D75M50402	A75M50222-3	MS3106R14S-2S	MS3106R14S-2P	
57A13A1W1	D75M11313-1	D75M50402-108	A75M50222-3	MS3106R14S-2P	MS3106R14S-2S	
57A23W1	D75M11313-3	D75M06861-122	MIL-W-5086	SOCKET PLUG # PS506B	BANANA PLUG BIRNBACH 398	
57A23W2	D75M11313-4	D75M06860-90	MIL-W-5086	SOCKET PLUG # PS506GN	BANANA PLUG BIRNBACH 398	
57A23W3,4,5	D75M13461-8,-9,-10	D75M13747	A75M10191	10-323640-85P	10-323640-63S	
57A23W6,7,8,9	-11,-12, -13,-14	D75M13748	A75M10192			
57A23W10,11,12,13	-15,-16, -17,-18	D75M13748	A75M10192			
57A23W14,15,16,17	-19,-20, -21,-22	D75M13749	A75M10193			
57A23W18	-23	D75M13750	A75M10194			
57A23W19	-24	D75M13751	A75M10195			
57A23W20	-25					
57A23W21	-26					
57A23W22	-27			10-323640-85P	10-323640-63S	
57A23W23	D75M13461-28					
57A23W24	D75M11313-6	D75M12116-126	A75M10204	CS3106A40-74S	10-323640-74P	
57A33W1	-10	D75M06030-4	MIL-W-5086	BANANA PLUG BIRNBACH 398	BANANA PLUG BIRNBACH 398	
57A33W2	-11	D75M12113-78	A75M10193	CA22511-23 (P)	10-323640-63S	
57A33W3	-12	D75M14147-78	A75M14073	CA22511-23 (P)		
57A33W4,5	-13,-14	D75M12112-78-79	A75M10192	CA22511-23 (P),-5(P)		
57A33W6	-15	D75M12113-79	A75M10193	CA22511-23 (P)		
57A33W7	-16	D75M12114-79	A75M10194			
57A33W8,9,10,11	-17,-18, -19,-20	D75M12111-80,-80, -80,-81	A75M10191			
57A33W12	-21	D75M12113-81	A75M10193			
57A33W13	-22	D75M12115-81	A75M10195			
57A33W14	-23	D75M12114-82	A75M10194			
57A33W15	D75M11313-24	D75M12112-82	A75M10192	CA22511-23 (P)	10-323640-63S	
57A33W16						
279W1,2	D75M03417-1,-2	D75M03416-6,-30	A75M50223-7	CA22511-0 (P)	CA22512-1(S)	
279W3	-3	D75M03418-30	A75M50222-3	MS3106E14S-2P	MS3106E14S-2S	
279W4	-4	D75M04019-15	A75M50222-3	MS3106E14S-2P	MS3106E14S-2S	
279W7	-7	D75M03419-10	TYPE SO	MS3106E22-2P	MS3106E14S-7S	
279W11	D75M03417-11	D75M50402-30	A75M50222-3	MS3106R14S-2P	MS3106R14S-2S	DE

UMBILICAL ARM NO. 3

Figure 2-6. Cable Interconnect Diagram, Umbilical Service Arm, Number 3 (Sheet 2 of 2)



BULK CABLE CODE

A75M50222

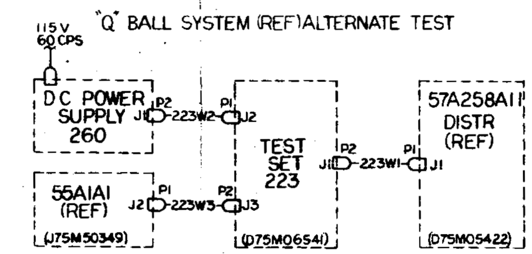
-2	3C #18
-3	4C #18
-6	60C #18

A75M50223

-7	60C #18

REF DES	CABLE ASSY	CABLE SUB-ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
54A1W7			7C#10 MI			DE
54A1W8			7C#10 MI			
57A14W1						
57A14W2						
57A14W3	D75M13462 -1	D75M50402	A75M50222 -3	MS3106R14S -2S	MS3106R14S -2P	
57A14W4	D75M13462 -2	D75M50712	A75M50222 -6	CA22512-1 (S)	10-323640 -53P	
57A14W5	D75M13462 -3	D75M03511	A75M50222 -2	MS3106R10SL-3P	MS3106R14S -7S	
57A14W6						
57A14W9	D75M13462 -4	D75M03511	A75M50222 -2	MS3106R10SL-3P	MS3106R14S -7S	
57A14W10						
57A14W11	D75M13462 -5	D75M03511	A75M50222 -2	MS3106R10SL-3P	MS3106R14S -7S	
57A14W12	D75M13462 -6	D75M50404	A75M50222 -2	MS3106R14S -7P	MS3106R14S -7S	
57A14W13	D75M13462 -7	D75M50402	A75M50222 -3	MS3106R14S -2S	MS3106R14S -2P	
57A14A1W1	D75M11314 -1	D75M50402 -80	A75M50222 -3	MS3106R14S -2P	MS3106R14S -2S	
57A26W3	D75M11314 -2	D75M06861 -77	MIL-W-5086	SOCKET PLUG #PS 50 6B	BANANA PLUG BIRNBACH 398	
57A26W4	D75M11314 -3	D75M06860 -77	MIL-W-5086	SOCKET PLUG #PS 50 66N	BANANA PLUG BIRNBACH 398	
57A26W5,6	D76M13462 -8,9	D75M13748	A75M10192	10 323640 -85P	10 323640 -63S	
57A26W7,8	-10,11			-85P	-63S	
57A26W9,10	-12,13			-85P	-63S	
57A26W11,12	-14,15	D75M13748	A75M10192	-85P	-63S	
57A26W13,14	-16,17	D75M14103	A75M11008	-85P	-63S	
57A26W15,16	-18,19	D75M14103	A75M11008	-85P	-63S	
57A26W17,18	-20,21	D75M14104	A75M10200	-75P	-75S	
57A26W19	-22			10 323640 -68P	10 323640 -68S	
57A26W20	D75M13462 -23					
57A36W1	D75M11314 -4	D75M06030 -4	MIL-W-5086	BANANA PLUG BIRNBACH 398	BANANA PLUG BIRNBACH 398	DE
57A36W2						
57A36W3						
57A36W4						
57A36W5						
57A258A1W1						
57A258A1W2						
57A258A1W3						
57A258A1W4						
57A258A1W5						
57A258A1W6						
57A258A2W1						
57A258A2W2						
57A258A2W3						
57A258A2W4						
223W1						
223W2						
223W3						
279W1,2	D75M03417 -1,2	D75M03416 -6,30	A75M50223 -7	CA22511-0 (P)	CA22512-1 (S)	DE
279W3	-3	D75M03418 -30	A75M50222 -3	MS3106E14S -2P	MS3106E14S -2S	
279W4	-4	D75M04019 -15	A75M50222 -3	MS3106E14S -2P	MS3101E14S -2S	
279W7	-7	D75M03419 -10	TYPE SO	MS3106E22 -2P	MS3106E14S -7S	
279W11	D75M03417 -11	D75M50402 -30	A75M50222 -3	MS3106R14S -2P	MS3106R14S -2S	DE

"Q" BALL SYSTEM (REF) ALTERNATE TEST



UMBILICAL ARM NO.4

Figure 2-7. Cable Interconnect Diagram, Umbilical Service Arm, Number 4 the access arm level are designed and/or provided by DE. The LCC panel is designed and furnished by MSFC. Design criteria for the LCC panel are furnished by DE. The cable interconnect diagram for the Apollo access arm is presented in figure 2-8, sheet 1 of 2. The cable interconnect diagram for the environmental chamber, Apollo GOX module, and pneumatic equipment box is presented in figure 2-8, sheet 2 of 2.

2-4. CABLE MASTS, FUEL AND LOX MAST RETRACT AND HOLDDOWN ARMS RELEASE

The command signal for the cable and the propellant masts retraction and the holddown arms release is provided by the automatic launch sequence program by way of the MSFC ESE that forms an interface with relay distributor 55A1A1. The relay logic therein actuates the components in the appropriate valve panels, thereby executing the retract or release cycle. The cable interconnect diagram showing the functions is presented in figures 2-1 and 2-9.

2-5. HYDRAULIC CART

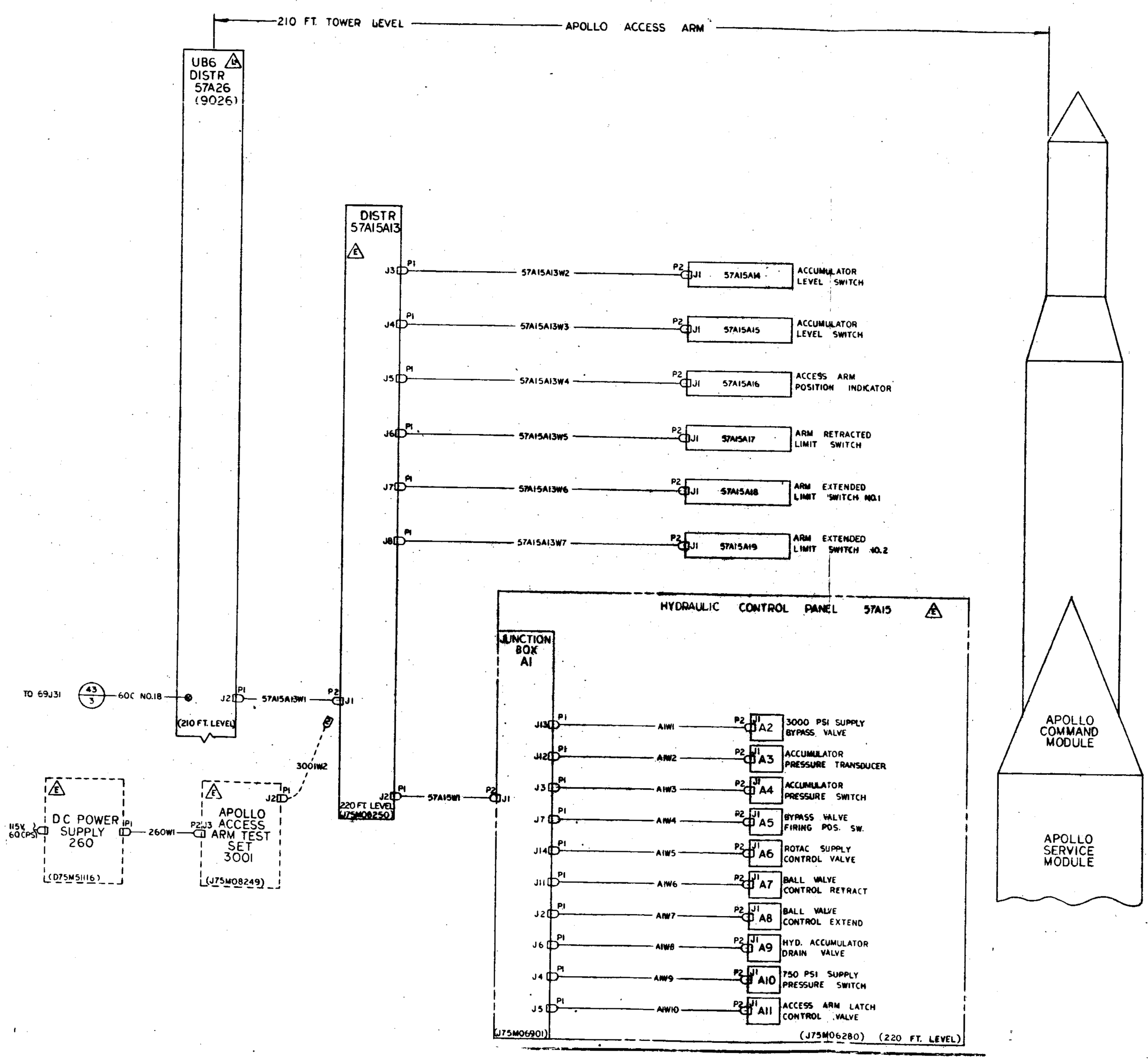
The hydraulic cart is located in the first floor of the AGCS. The cart provides the hydraulic power in the accumulators for actuating the umbilical arms and the Apollo access arm. The hydraulic pressure is remotely controlled by means of the hydraulic control panels located at the 90-foot, 110-foot, 160-foot, and the 200-foot levels on the umbilical tower. The electrical system criteria for the hydraulic cart are provided under the design cognizance of DE.

2-6. ENGINE SERVICING PLATFORM

The engine servicing platform serves as an accessory to the launcher. It provides a retractable platform under the vehicle to facilitate servicing in the boattail area and to permit engine removal, if required. The platform and engine removal winch are operated manually. The electrical systems for operating the platform were designed under the cognizance of DE.

2-7. ENGINE SERVICING TRAILERS

The primary functions of the engine servicing trailers are to provide metered RP-1 fuel for the TC fuel jack services, regulated GN_2, and pressurized trichloroethylene solvent for LOX dome decontamination and engine removal decontamination services of the H-1 engine assemblies. The secondary functions of the trailers are to provide pressurized trichloroethylene solvent, RP-1 fuel, and regulated GN_2 for pressure leak test flushing and/or purging services on components, lines, and tubing throughout the launch complex that

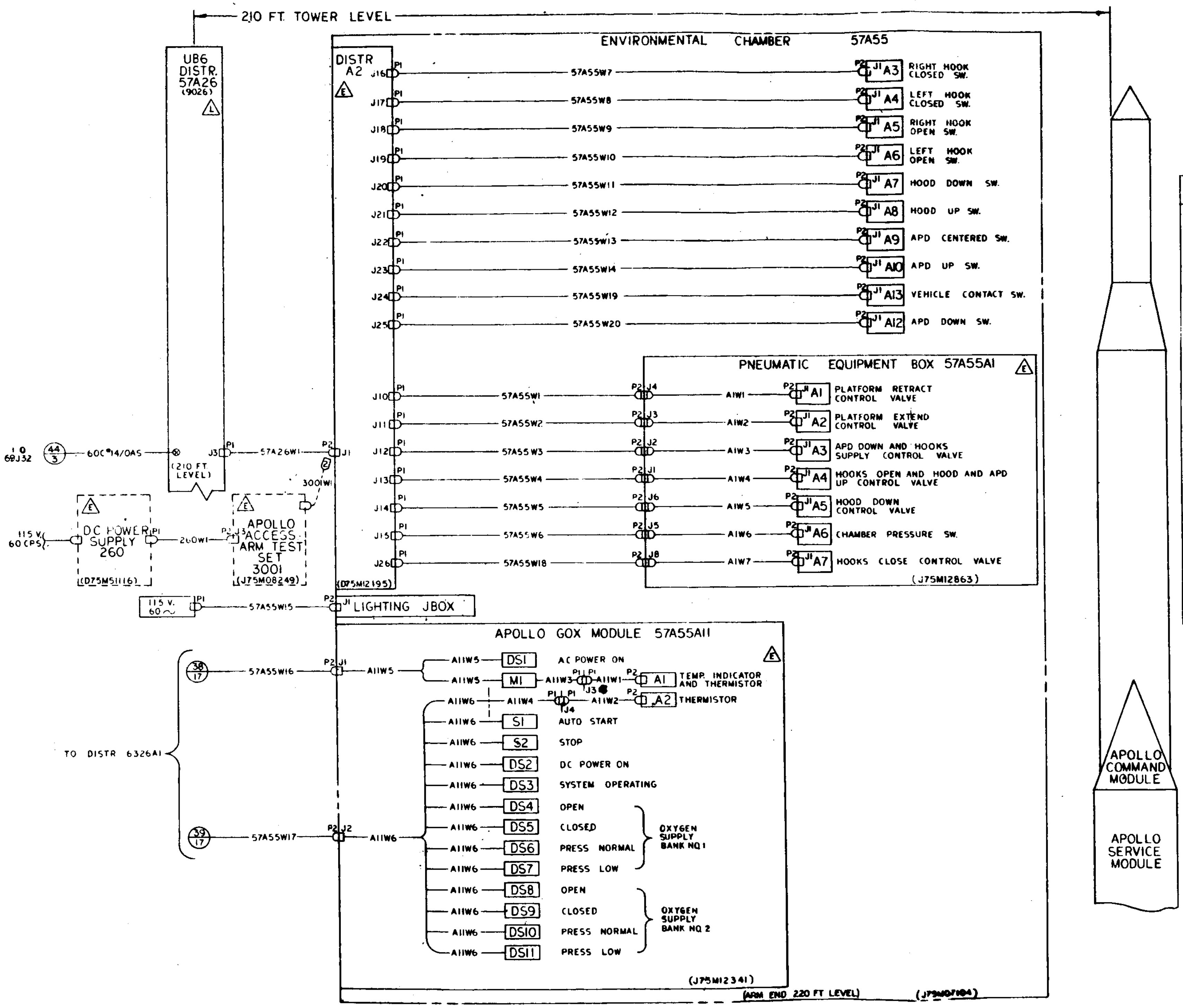


BULK CABLE CODE
A75M50222
-2 3C#18
-3 4C#18
-6 60C#18

REF DES	CABLE ASSY	CABLE SUB ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
57A15W1	D75M07248 -45	D75M07271 - 16	A75M50222 - 6	CA225111-0 (P)	CA22512-1 (S)	
57A15A1W1	D75M07248 -1	D75M06895 - 4	A75M50222 -3	MS3106R14S -2P	MS3106R14S - 2S	DE
57A15A1W2	-2	D75M06892 - 4	-3	-2P	PT06P-8-4S -343	
57A15A1W3	-3	D75M50403 - 4	-2	-7P	MS3106R10SL- 3S	
57A15A1W4	-4	D75M50404 - 2	-2	-7P	MS3106R14S -7S	
57A15A1W5	-5	D75M50403 - 3	-2	-7P	MS3106P10SL-3S	
57A15A1W6,7	-6,7	D75M06895 - 3,4	-3	-2P	MS3106R14S -2S	
57A15A1W8	-8	D75M06895 - 4	-3	-2P	-2S	
57A15A1W9	-9	D75M50404 - 4	-2	-7P	-7S	
57A15A1W10	-10	D75M06895 - 3	-3	MS3106R14S-2P	MS3106R14S -2S	
57A15A13W1	-46	D75M50712 -50	-6	10 323640 -53P	CA22512-1 (S)	
57A15A13W2,3	-39,40	D75M50403 - 8,7	-2	MS3106R14S-7P	MS3106R10SL-3S	
57A15A13W4	-41	D75M50404 - 28	-2	-7P	MS3106R14S -7S	
57A15A13W5,6	-42,43	D75M50403 - 28,30	-2	-7P	MS3106R10SL-3S	
57A15A13W7	D75M07248 -44	D75M50403 - 30	A75M50222 - 2	MS3106R14S-7P	MS3106R10SL-3S	DE
260W1						
3001W2						

APOLLO ACCESS ARM

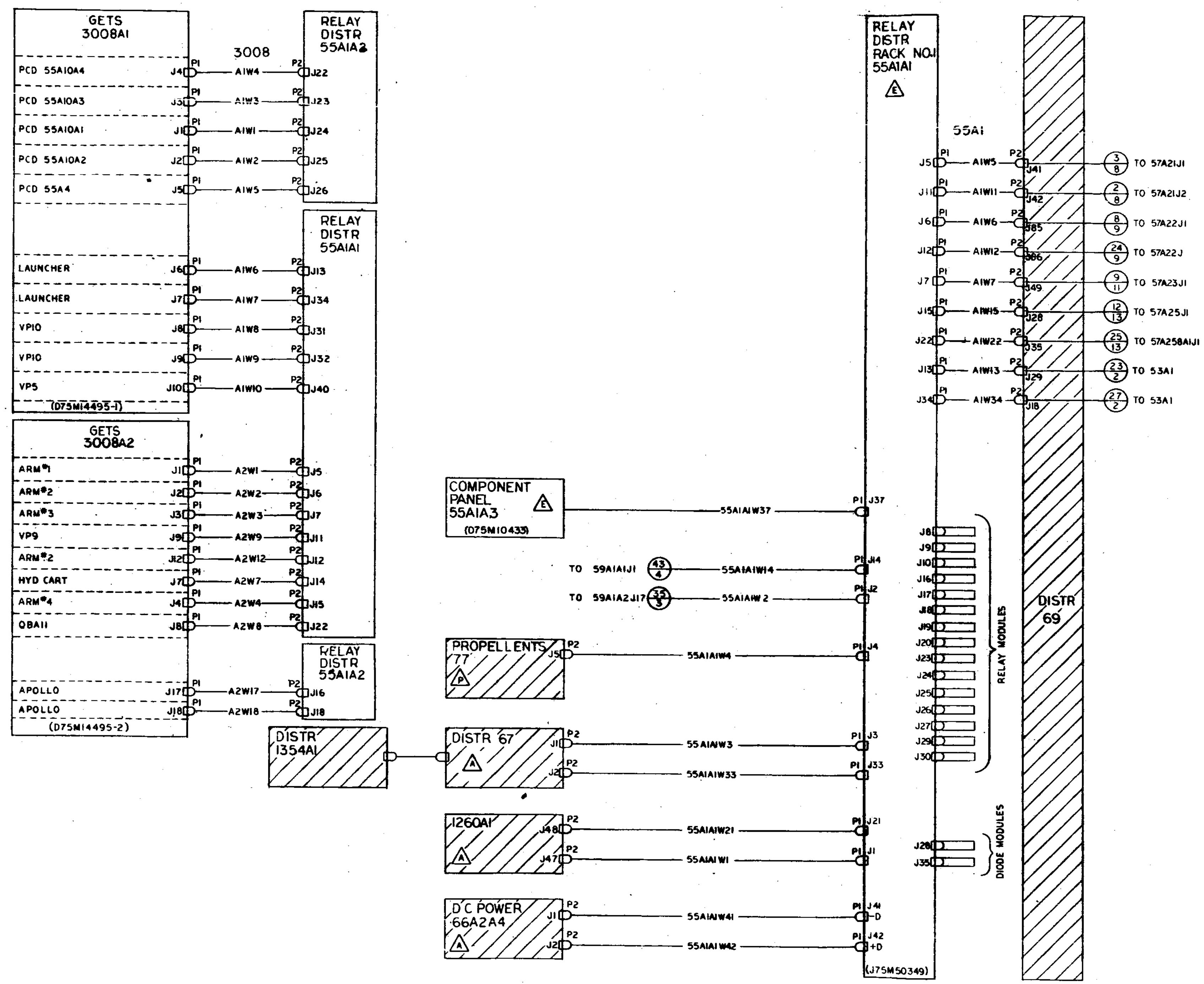
Figure 2-8. Cable Interconnect Diagram, Apollo Access Arm (Sheet 1 of 2)



REF DES	CABLE ASSY	CABLE SUB ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
57A26W1						
57A55W1						
57A55W2						
57A55W3						
57A55W4						
57A55W5						
57A55W6						
57A55W7						
57A55W8						
57A55W10						
57A55W11						
57A55W12						
57A55W13						
57A55W14						
57A55W15	D75M72418-12	D75MC6182-99	MSFC-SPEC-35/768 3C12	3107W RESSELL & STOLL	MS3106R16-10S	DE
57A55W16	D75MC7248-15	D75M50402-97	A75M50222-3	MS3106F14S-2P	MS3106R14S-2S	DF
57A55W17	D75M07248-14	D75M11710-97	A75M50222-38	MS3106F32-8P	MS3106A32-8S	DE
57A55W18						
57A55W19						
57A55W20						
57A55A1W1						
57A55A1W2						
57A55A1W3						
57A55A1W4						
57A55A1W5						
57A55A1W6						
57A55A1W7						
57A55A11W1						
57A55A11W2						
57A55A11W3						
57A55A11W4						
57A55A11W5						
57A55A11W6						
260W1						
3001W1						

ENVIRONMENTAL CHAMBER

Figure 2-8. Cable Interconnect Diagram, Apollo Access Arm (Sheet 2 of 2)



BULK CABLE CODE

A75M50223
-7 60C #20
-8 61C #20

REF DES	CABLE ASSY	CABLE SUB-ASSY	BULK CABLE	P1 CONNECTOR	P2 CONNECTOR	FURN BY
55A1A1W1						ASTR
55A1A1W2	D75M13819-2	D75M50438-3	A75M50223-8	PT06P-24-61S-343	PT06P-24-61S-343	DE
55A1A1W3						ASTR
55A1A1W4	D75M13819-4	D75M50438-100	A75M50223-8	PT06P-24-61S-343	PT06P-24-61S-343	DE
55A1A1W5,6	-5,6	D75M50437-31	-8		PT06P-24-61P-343	
55A1A1W7,11	-7,11	D75M50437-30,31	-8		PT06P-24-61P-343	
55A1A1W12,13	-12,13	D75M50437-31	-8		PT06P-24-61P-343	
55A1A1W14	-14	D75M13663-100	-7		CA22512-1(S)	
55A1A1W15	D75M13819-15	D75M50437-31	A75M50223-8	PT06P-24-61S-343	PT06P-24-61P-343	DE
55A1A1W21						ASTR
55A1A1W22	D75M13819-22	D75M50437-32	A75M50223-8	PT06P-24-61S-343	PT06P-24-61P-343	DE
55A1A1W33						ASTR
55A1A1W34	D75M13819-34	D75M50437-31	A75M50223-8	PT06P-24-61S-343	PT06P-24-61P-343	DE
55A1A1W37	COMPONENT PANEL					DE
55A1A1W38	D75M13819-38	D75M50438-31	A75M50223-8	PT06P-24-61S-343	PT06P-24-61P-343	DE
55A1A1W41						ASTR
55A1A1W42						ASTR
3008A1W1	D75M14489-1	D75M50437-20	A75M50223-8	PT06P-24-61P-343	PT06P-24-61S-343	DE
3008A1W2	-2	-20	-8			
3008A1W3	-3	-20	-8			
3008A1W4	-4	-20	-8			
3008A1W5	-5	-20	-8			
3008A1W6	-6	-20	-8			
3008A1W7	-7	-20	-8			
3008A1W8	-8	-20	-8			
3008A1W9	-9	-20	-8			
3008A1W10	D75M14489-10	-20	-8			
3008A2W1	D75M14490-1	-20	-8			
3008A2W2	-2	-20	-8			
3008A2W3	-3	-20	-8			
3008A2W4	-4	-20	-8			
3008A2W7	-7	-20	-8			
3008A2W8	-8	-20	-8			
3008A2W9	-9	-20	-8			
3008A2W12	-12	-20	-8			
3008A2W17	-17	-20	-8			
3008A2W18	D75M14490-18	D75M50437-20	A75M50223-8	PT06P-24-61P-343	PT06P-24-61S-343	DE

GETS & 55A1A1 RELAY DISTR

Figure 2-9. Cable Interconnect Diagram, Cable Masts, Fuel and LOX Mast Retract and Holddown Arms Release are within the preregulated flow rate capabilities of the trailer. Operation is controlled by ac and dc electrical circuits and mechanical components located at the distributor assembly and operator panels on each trailer and at various points within the trailer enclosure. (See figure 2-10.) The electrical systems for operating the engine servicing trailers were designed under the cognizance of DE.

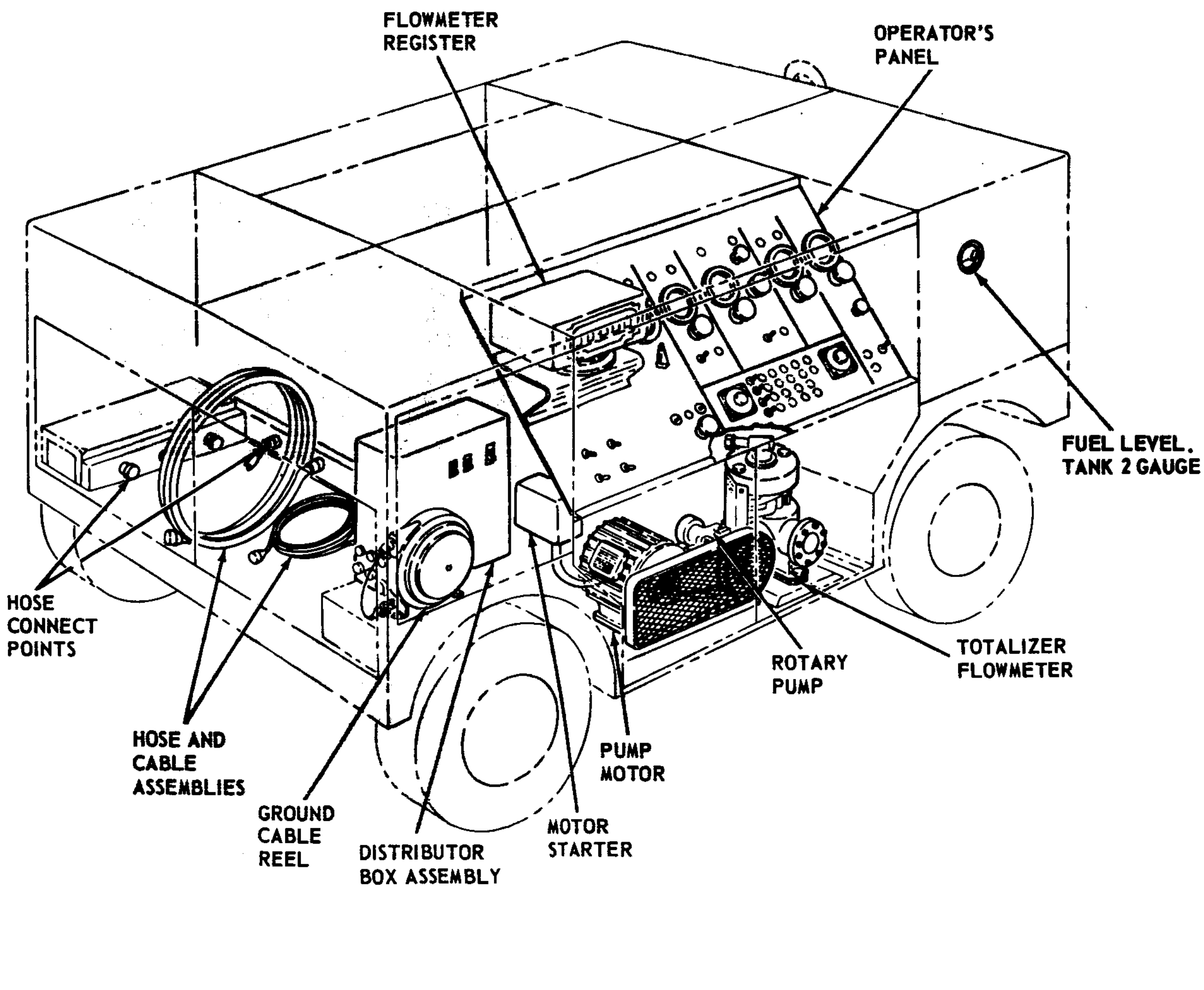


Figure 2-10. Operator's Control Panel, Engine Servicing Trailers

SECTION III
PROPELLANTS AND GASES ELECTRICAL SYSTEMS

3-1. GENERAL

The Propellant Systems Branch (DP electrical equipment in the LCC and AGCS for propellants and gases consists of the following:

a. LCC-11 racks, containing the following equipment, in the noted quantities:

(1) RP-1 DC Power Panel - 1
(2) RP-1 Components Panel - 1
(3) RP-1 Control Panel - 1
(4) RP-1 Relay Distributors - 2
(5) S-IB RP-1 Tanking Computer Panel - 1
(6) Common Relay Distributor - 1
(7) Propellants and Gases System Power Control Panel - 1
(8) LOX Relay Distributors - 3
(9) Communications Monitor Panel - 1
(10) LOX DC Power Panel - 1
(11) LOX Components Panel - 1
(12) LOX Control Panel - 1
(13) Timer Panels, LOX and LH_2 - 2
(14) LOX Supply Monitor Panel - 1
(15) S-IVB LOX Tanking Computer Panel - 1
(16) S-IB LOX Tanking Computer Panel - 1
(17) Liquid Hydrogen (LH_2) DC Power Panel - 1
(18) LH_2 Components Panel - 1
(19) LH_2 Control Panel - 1
(20) LH_2 Relay Distributors - 2
(21) LH_2 Monitor Panel - 1
(22) S-IVB LH_2 Tanking Computer Panel - 1
(23) Digital Events Evaluator (3 racks and 1 teletypewriter) - 1
(24) Chiller Control Panel (ECS) - 1
(25) Service Module Panel (ECS) - 1
(26) Command Lunar Excursion Module (LEM) Panel (ECS) - 1
(27) Distributors (ECS) - 3
(28) Conditioned Gas Temperature Evaporator Discharge Panel - 1
(29) Intake Air Nitrogen Purge Panel - 1
(30) System Control Panel - 1
(31) Converter Compressor Distributor - 1
(32) Instrument Unit Panel - 1
(33) S-IVB Engines Panel (ECS) - 1
(34) RP-1 Auxiliary Components Panel - 1

(35) LOX Auxiliary Components Panel - 1
(36) LH_2 Auxiliary Components Panel - 1
(37) S-IB FWD Panel
(38) S-IB Engines Panel

b. AGCS - 10 racks, containing the following equipment, in the noted quantities:

(1) ECS Converter AC Power Panel - 1
(2) ECS Converter Panel - 1
(3) 27-Connector Shielded Patch Racks - 2
(4) 14-Connector Shielded Patch Rack - 1
(5) Main DC Power Panel - 1
(6) Negative Bus Panel - 1
(7) Propellant DC Power Distributor - 1
(8) 54-Connector Unshielded Patch Rack - 1
(9) S-IVB LOX Tanking Computer - 1
(10) S-IVB LH_2 Tanking Computer - 1
(11) S-IB LOX Tanking Computer - 1
(12) S-IB RP-1 Tanking Computer - 1
(13) Tanking Computer Patch Rack (42 unshielded connections) - 1
(14) Spare - 1

3-2. RP-1 TANKING ELECTRICAL SYSTEM

NOTE

The loading procedures described herein are preliminary and are subject to change.

The RP-1 electrical system includes equipment in the RP-1 storage facility, the RP-1 electrical equipment house, the RP-1 pit in the launch area, and in the gases and propellants racks in the LCC.

DP equipment located in the RP-1 storage facility and the electrical equipment house includes the following, in the noted quantities:

a. Negative Bus Panel - 1
b. DC Power Panel - 1
c. Distributor - 1
d. Fuel Control Box - 1
e. 440 VAC Power Panel - 1
f. Starters for 150-HP Fuel Transfer Pump Motors - 2
g. Starters for 10-HP Filter/Separator Pump Motors - 1
h. Terminal Distributors - 3

DP equipment located in the RP-1 pit in the launch area consists of one terminal distributor and one replenish valve control assembly.

The RP-1 system uses two 1,000-gpm centrifugal pumps that are powered by two 150-hp, ac motors for fuel transfer. The fuel transfer pumps and the storage tank fill and refiltering pumps, powered by a 10-hp, ac motor, are located at the storage facility.

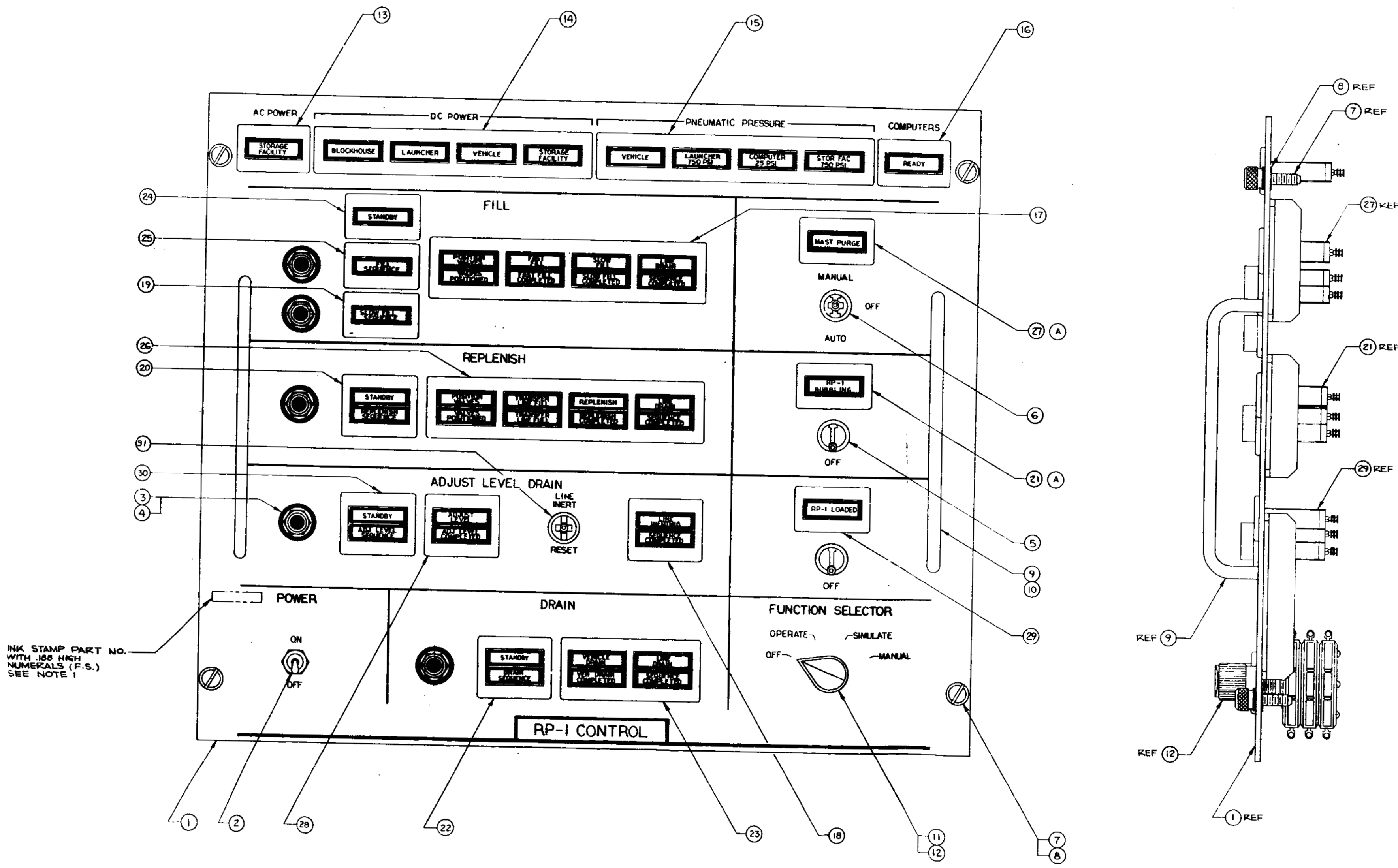
Contained in the propellants and gases racks in the LCC are the RP-1 control panel, the RP-1 components panel and the RP-1 PTCS control and monitor panel. The control panel controls power, fill command, drain command, level adjust command, replenish, and the mode of operation ("operate," "simulate," and "manual") for the RP-1 system. The control panel face layout is shown in figure 3-1.

The components panel monitors and controls various functions of the S-IB stage, launch area, and storage facility. The components panel face layout is shown in figure 3-2. Conditions monitored on the S-IB stage are vent valve positions, fill and drain valve positions, and overfill indications. Monitored in the launch area are liquid sensor, booster line valve positions, and level adjust valve positions. Monitored in the storage area are fast fill valve positions, restricted flow valve positions, pump motors conditions, liquid sensor indicators, gravity drain valve positions, power drain valve positions, and RP-1 temperature at the transfer pumps and filters. The propellant loading ground equipment test set is used to check out the RP-1 electrical system.

Provided that the system is in standby condition the automatic fill sequence is initiated by positioning the selector switch to OPERATE position and depressing the FILL SEQUENCE pushbutton on the RP-1 control panel. RP-1 is pumped from the storage area to the S-IB fuel tanks at a rate of approximately 2,000 gpm. The fast fill continues until 98 percent of full level is reached. At this point (98 percent), the fuel flow is decreased to 200 gpm by means of the slow fill sequence initiated by a command signal from the propellant tanking computer system (PTCS) and RP-1 flow continues to the 102-percent level in the S-IB fuel tank. At this level (102 percent), the fuel in the transfer line is drained back to the storage tank through the jet eductor.

At the appropriate time in the countdown, the level adjust command is executed and the S-IB fuel tank is drained through the level adjust valve to the 100-percent mission level. The level adjust valve is a throttling valve that is controlled by the PTCS. immediately prior to engine ignition, the line inerting sequence which completes the fuel loading sequence is executed.

In the event of an aborted launch, the S-IB stage fuel tank is drained by initiating the drain command. The fuel tank is gravity drained until it is more than 90-percent empty, following which, a power drain operation is utilized to complete draining of the vehicle transfer lines. The RP-1 schematic showing the electrical system interconnects and the electrical equipment location is presented in figure 3-3.



NOTES:
UNLESS OTHERWISE SPECIFIED

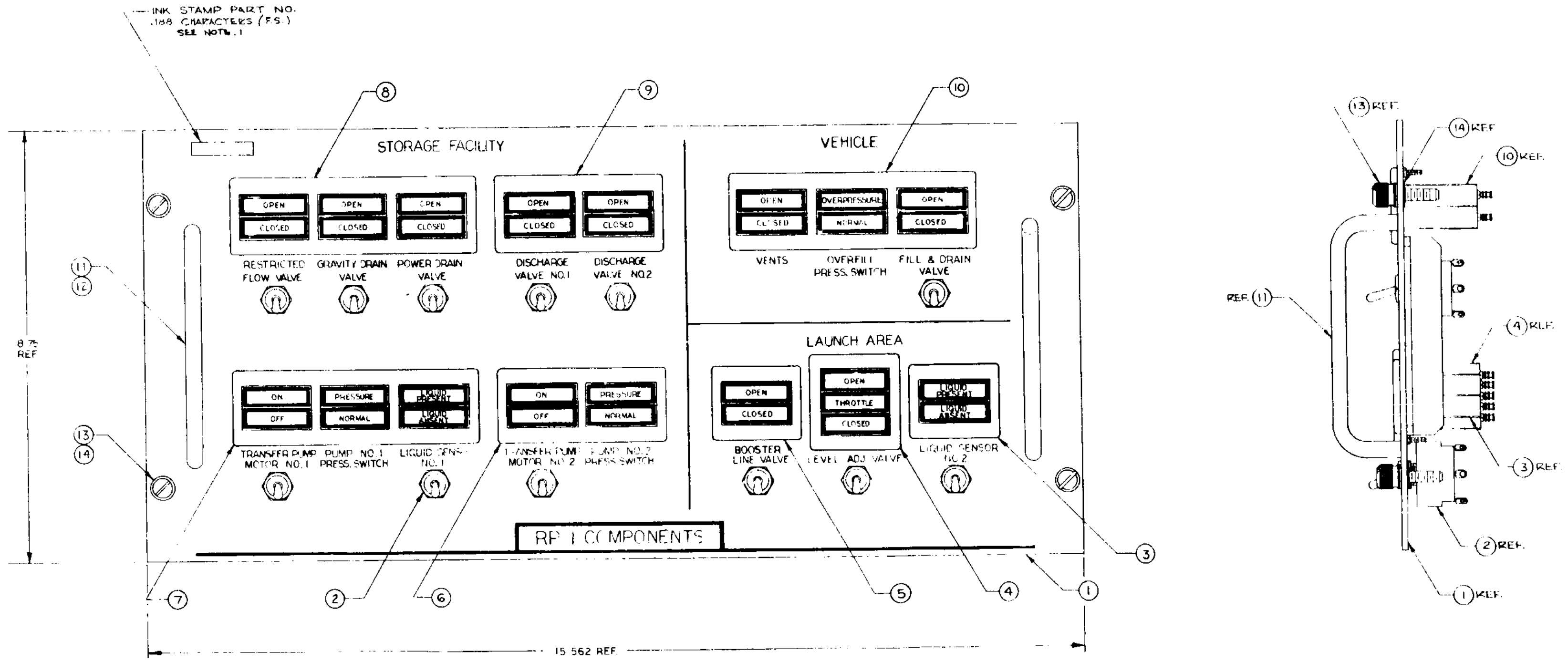
1. MARK PART PER MIL-STD-130, USING INK PER SPEC TT-I-558
2. CUTLER-HAMMER INC., MILWAUKEE 1, WISCONSIN (OR EQUAL)
3. SOUTH CHESTER CORPORATION, [illegible] LESTER, PENN. (OR EQUAL)
4. RAYTHEON MFG. CO. NEEDHAM HEIGHTS, MASS. (OR EQUAL)
5. MICRO-SWITCH DIVISION, MINNEAPOLIS-HONEYWELL REGULATOR COMPANY, FREEPORT, ILL. (OR EQUAL)
6. CAMBRIDGE THERMIONIC CORP., CAMBRIDGE, MASS. (OR EQUAL)
7. SILKSCREEN PER DWG 10468024 PRIOR TO ASSEMBLY

FIND NO.	DESCRIPTION	NO. REQ'D	PART NO. OR DWG NO.	MFR. NO.	REMARKS
31	SWITCH	1		8844K14	SEE NOTE 2
30	LIGHT ASSY, INDICATOR	1	10468025		
29	LIGHT ASSY, INDICATOR	1	10467853		
28	LIGHT ASSY, INDICATOR	1	10468026		
27	LIGHT ASSY, INDICATOR	1	10467872		
26	LIGHT ASSY, INDICATOR	1	10467862		
25	LIGHT ASSY, INDICATOR	1	10467852		
24	LIGHT ASSY, INDICATOR	1	10467859		
23	LIGHT ASSY, INDICATOR	1	10467867		
22	LIGHT ASSY, INDICATOR	1	10467866		
21	LIGHT ASSY, INDICATOR	1	10467873		
20	LIGHT ASSY, INDICATOR	1	10467865		
19	LIGHT ASSY, INDICATOR	1	10467871		
18	LIGHT ASSY, INDICATOR	1	10467864		
17	LIGHT ASSY, INDICATOR	1	10467861		
16	LIGHT ASSY, INDICATOR	1	10467858		
15	LIGHT ASSY, INDICATOR	1	10467869		
14	LIGHT ASSY, INDICATOR	1	10467870		
13	LIGHT ASSY, INDICATOR	1	10467857		
12	KNOB	1		90-4-2G	SEE NOTE 4
11	SWITCH	1		8918K958	SEE NOTE 2
10	SCREW	4	AN507-1032-10		
9	HANDLE	2		1955	SEE NOTE 6
8	WASHER	4		12-11014-11	SEE NOTE 3
7	SCREW	4		12-13-404-14	SEE NOTE 3
6	SWITCH	1		8844K1	SEE NOTE 2
Ⓐ 5	SWITCH	2		8844K6	SEE NOTE 2
4	GUARD	5		15PA17	SEE NOTE 5
3	SWITCH	5		3PB-206-T2	SEE NOTE 5
2	SWITCH	1		8825K6	SEE NOTE 2
1	PANEL	1	10468023		

LIST OF MATERIALS

EFFECTIVITY - SATURN I, BLOCK II

Figure 3-1. Control Panel Face Layout, RP-1 Control System



NOTES:
UNLESS OTHERWISE SPECIFIED
1. MARK PART PER MIL-STD-130, USING INK PER TT-I-558

Y APPROVED SOURCE
CUTLER-HAMMER
MILWAUKEE 1, WISCONSIN OR EQUAL

5 APPROVED SOURCE
SOUTH CHESTER CORP.
LESTER PENN OR EQUAL

FIND NO.	DESCRIPTION	NO. REQ'D	PART NO. OR DWG. NO.	MFR PART NO.	REMARKS
14	WASHER	4		12-11014-11	SEE NOTE 3
13	SCREW	4		12-13 404-4	SEE NOTE 3
12	SCREW	4	AN507-1032-10		
11	HANDLE	2	8993385-2		
10	LIGHT ASSY, INDICATOR	1	10468019		
9	LIGHT ASSY, INDICATOR	1	10467874		
8	LIGHT ASSY, INDICATOR	1	10467877		
7	LIGHT ASSY, INDICATOR	1	10467876		
6	LIGHT ASSY, INDICATOR	1	10468020		
5	LIGHT ASSY, INDICATOR	1	10466658		
4	LIGHT ASSY, INDICATOR	1	10466657		
3	LIGHT ASSY, INDICATOR	1	10467875		
2	SWITCH	12		8825-K6	SEE NOTE 2
1	PANEL	1	10468017		

LIST OF MATERIAL

Figure 3-2. Components Panel Face Layout, RP-1 Control System

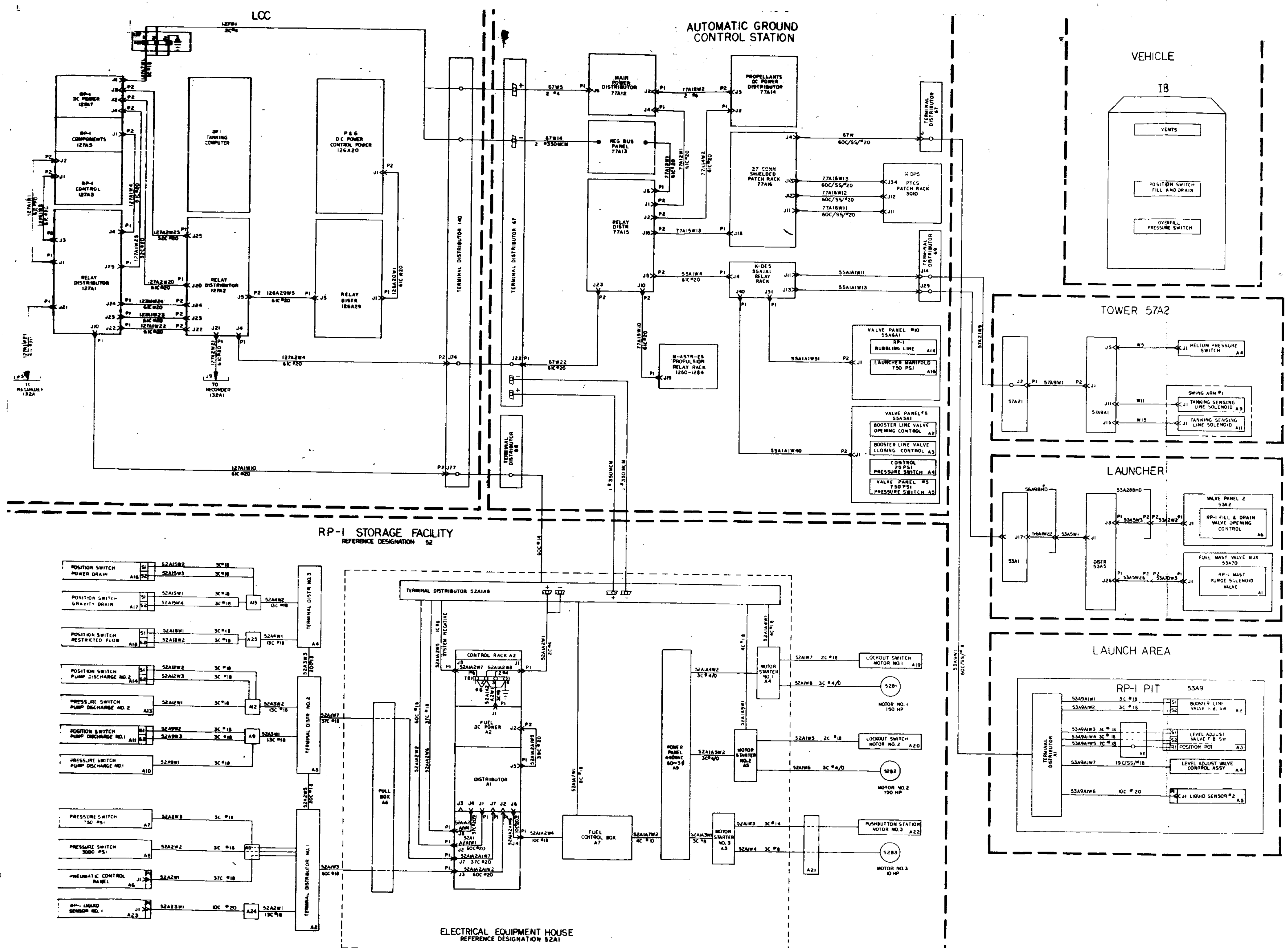


Figure 3-3. Electrical System Interconnects and Electrical Equipment Location, RP-1 Control System

3-3. LOX TRANSFER ELECTRICAL SYSTEM

The LOX system consists of the LOX storage area and the LOX transfer system. Included in the storage facility is the following DP electrical control equipment, in the noted quantities:

a. Main Control Distributor - 1
b. Instrumentation Distributors - 2
c. Pad Distributor - 1
d. Relay Box - 1
e. Starters for 15-HP Heat Exchanger Blower Motors - 2
f. Starter for 20-HP Replenishing Pump Motor - 1
g. Starter for 350-HP S-IB Main Transfer Pump Motor - 1
h. Starters for 200-HP S-IVB Main Transfer Pump Motors - 2

The LOX transfer system provides liquid oxygen for filling and replenishing the Saturn IB vehicle LOX tanks for each stage. The electrical system provides for the operation, control, checkout, and monitoring of the LOX transfer system which is performed remotely from the LCC.

The LOX system uses two main centrifugal transfer pumps. One is the 1,000-gpm S-IVB transfer pump that is powered by a 200-hp, 440-vac, 3-phase, induction motor. The other is the 3,100-gpm S-IB transfer pump that is powered by a 350-hp, 440-vac, 3-phase, induction motor. The LOX replenish pump is a 70-gpm (approximately) centrifugal pump driven by a 20-hp, ac motor. The main transfer pumps are used for the fast fill operation. The replenish pump is used to back up the replenishing tank which provides for topping and maintaining the oxidizer levels in the vehicle tanks by pressure transfer as controlled by the PTCS.

Located in the LCC are the following six panels:

a. LOX Control Panel
b. LOX Components Panel - 2
c. Auxiliary Components Panel
d. S-IVB LOX Mass Control Panel
e. S-IB LOX Computer Panel

The control panel controls power, fill commands, drain commands, and the mode of operation as shown in the panel face layout presented in figure 3-4. The components panel controls and monitors various functions in the S-IB and S-IVB stages, the storage facility, and the launch area. The components panels monitor conditions at the storage area, the transfer lines, and vehicle.

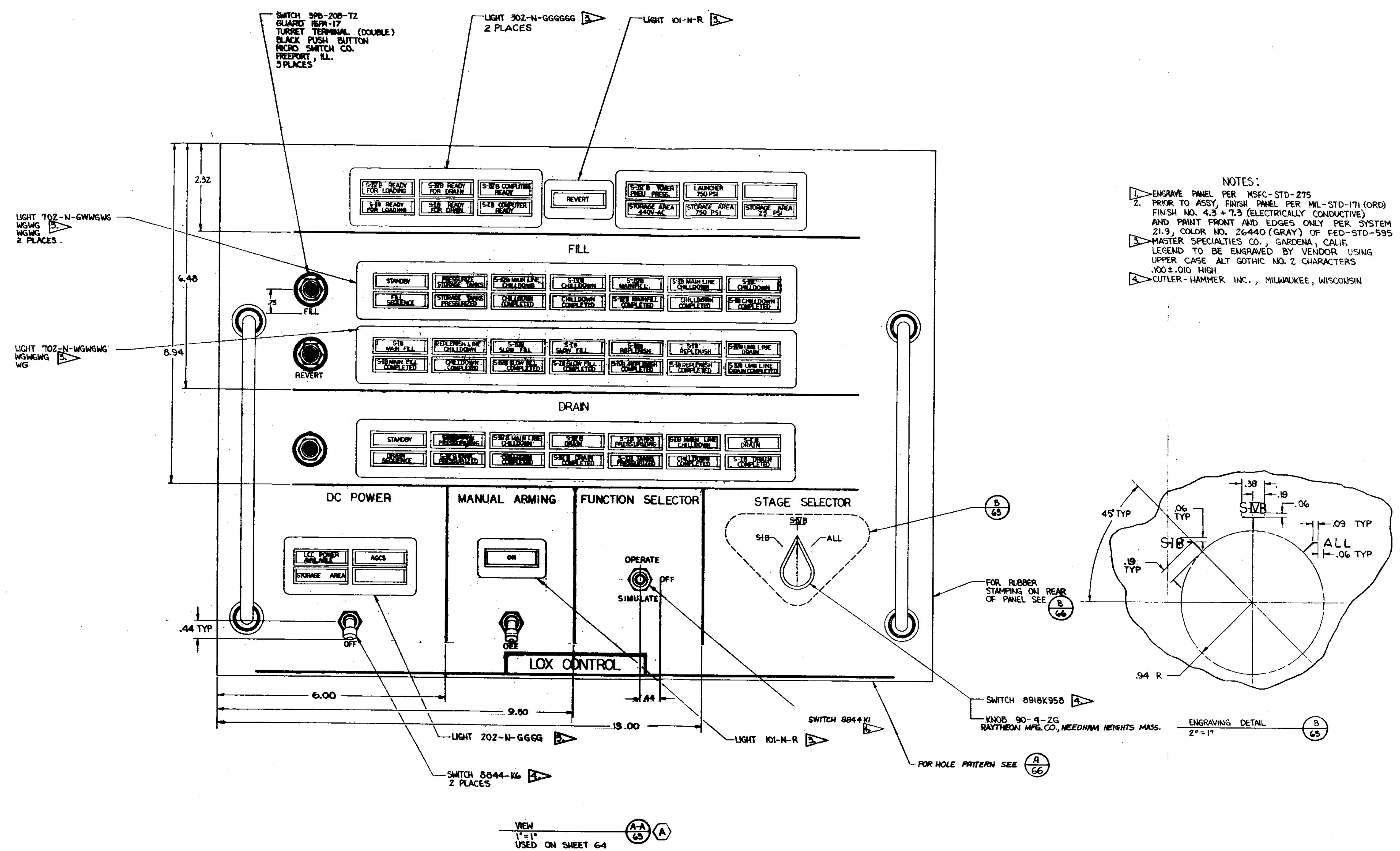


Figure 3-4. Control Panel Face Layout, LOX Transfer Electrical System

Conditions monitored and/or controlled in the vehicle by DP LOX system ESE are vent valve positions, fill and drain valve positions, overpressure indications, overfill indications, and replenish valve positions. Conditions monitored or controlled in the storage area are storage tank level, tank vent valve positions, replenish line valve positions, tank pressures, pump discharge pressures, replenish line vent valve positions, and circulating valve positions. Conditions monitored and/or controlled in the launch area are umbilical arm line vent valve positions, main fill valve positions, replenish bypass valve positions, and the S-IVB LOX liquid sensor.

Control is provided for the LOX system in the LCC control panel for automatic loading, simulate, and manual arming. The simulate command executes automatic sequencing of the entire LOX tanking operation without transfer of the LOX or operation of the transfer pumps. The LOX is cut off manually at the storage tanks. The manual arming command energizes a series of toggle switches on the components panel which permit any of the following actions:

a. Individual operation of any component in the system

b. Operation of a series of components to execute any sequence in the LOX tanking cycle

c. Capability of performing the entire LOX transfer operation manually

d. Manual operation of most components or series of components at any chosen point while in the automatic mode

The face layout of the components panel is presented in figure 3-5. The LOX loading in the automatic mode is controlled by relay logic located in the timer panels in the relay distributors in the LCC. Control commands and status information exchange between the LCC, AGCS, launch area, and storage facility is by way of hardwire circuits.

The PTCS monitors propellant mass during vehicle loading and provides discrete signals to the LOX system that are used during the automatic sequence for monitoring and controlling the vehicle oxidizer tanks at 100-percent full or at mission levels. The mission levels are maintained by the LOX system through the replenish valve for each stage which are modulated by the PTCS. The test equipment used in the LOX system checkout is the propellant loading ground equipment test set.

The LOX loading sequence is as follows: when prerequisite conditions are met throughout the LOX system, the storage tanks are pressurized and the precooling of the S-IVB fill line is executed for an interval of approximately 5 minutes. LOX is then loaded in the S-IVB LOX tank to 5 percent whereupon

To be supplied when available.

Figure 3-5. Components Panel Face Layout, LOX Transfer Electrical System (Sheet 1 of 2)

To be supplied when available.

Figure 3-5. Components Panel Face Layout, LOX Transfer Electrical System (Sheet 2 of 2) the S-IVB fast fill is executed to the 93-percent level. The S-IVB main fill line is then drained and the S-IB main fill line is precooled and the S-IB LOX tank filled to the 22-percent level, using storage tank pressure. At this point, fast fill is executed with the S-IB transfer pump to the 98.5-percent level. The S-IB main fill line is then drained and the S-IVB LOX tank is slow filled to 100 percent by way of the replenish line. The S-IB LOX tanks are then slow filled to the 100-percent level. During countdown operations, the LOX level is maintained at mission requirements through the LOX replenish control valves which are controlled by the PTCS. The interconnect diagram showing the LOX system equipment and locations and cable interconnects is presented in figure 3-6.

3-4. LIQUID HYDROGEN TRANSFER ELECTRICAL CONTROL SYSTEM

The LH_2 system consists of the storage facility, the transfer system, and the venting system.

Included in the equipment house is the following DP electrical equipment for the LH_2 system, in the noted quantities:

(a) Control Rack containing Control Distributors 1 and 2, a LH_2 DC Power Panel, and a LH_2 Monitor Panel - 1
(b) Motor Starter for 15-HP Storage Tank Vacuum Pump Motor - 1

Included at the storage facility is the following DP electrical equipment for the LH_2 system, in the noted quantities:

(a) Storage Tank Distributor Instrument Cabinet Sections (1 and 2) - 1
(b) 15-HP AC Vacuum Pump Motor - 1 (Portable)
(c) Terminal Distributor - 1

The LH_2 propellant loading system is a remotely controlled system used to transfer LH_2 propellant from the storage facility into the S-IVB stage of the Saturn IB and to purge the LH_2 transfer lines and the S-IVB LH_2 tanks.

The LH_2 propellant transfer is accomplished by pressurization of the LH_2 storage dewar. This is done by means of a vaporizer heat exchanger system and the LH_2 is thereby forced through a valving network and hence to the LH_2 tank of the S-IVB stage.

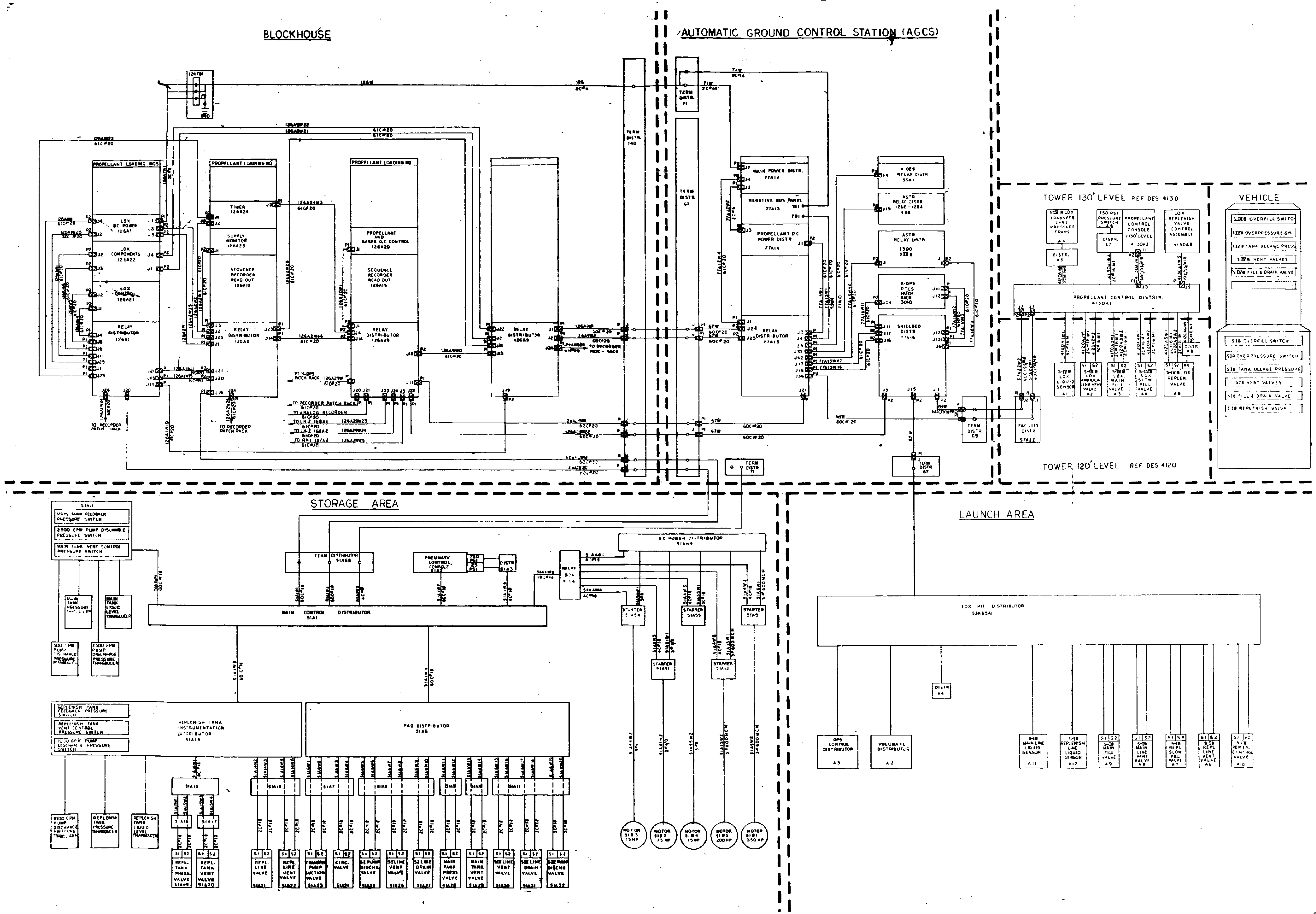


Figure 3-6. LOX System Interconnects and System Equipment Location

Located in the LCC are the following four panels, in the noted quantities:

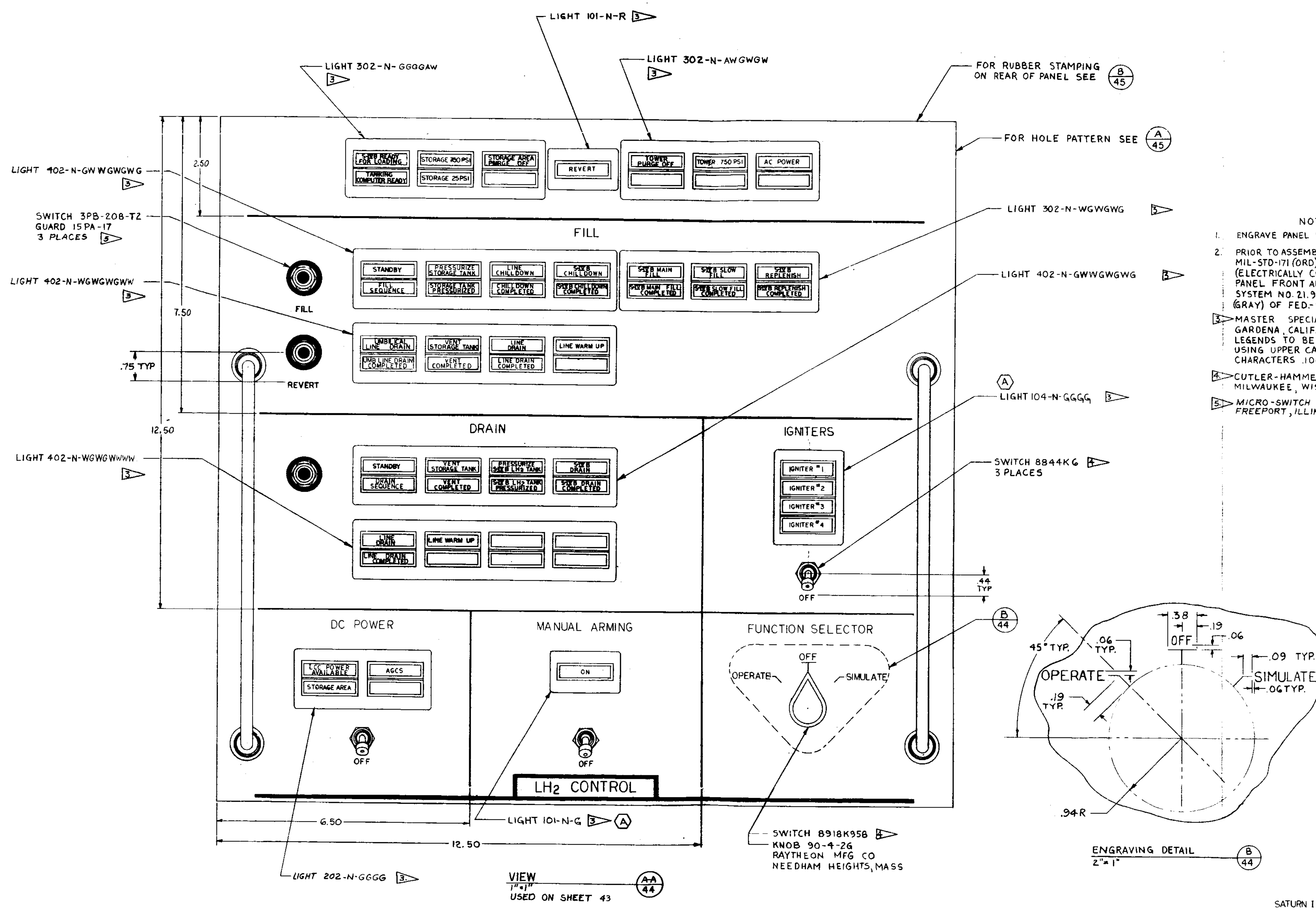
a. LH_2 Control Panel - 1
b. LH_2 Components Panel - 1
c. LH_2 Monitor Panel - 1
d. S-IVB LH_2 Tanking Computer Panel - 1

The control panel controls power, fill and drain commands, and the mode of operation. The components panel monitors and/or controls various functions in the umbilical tower and the storage area. The LH_2 monitor panel monitors status information at the storage facility and the launch pad. Conditions monitored and/or controlled by the components panel on the S-IVB stage are fill and drain valve positions, LH_2 vent valve positions, overfill indications, and overpressure indications. Monitored and/or controlled on the umbilical tower are S-IVB replenish valve positions, S-IVB main fill valve positions, S-IVB H_e transfer line purge valve positions, S-IVB transfer line purge valve positions, S-IVB vent line purge valve positions, S-IVB debris valve positions, S-IVB umbilical line purge indications, S-IVB umbilical line drain indications, H_e heat exchanger indications, and S-IVB liquid sensor indications. Monitored and/or controlled at the storage area are storage tank vent valve positions, storage tank pressure, chilldown transfer line conditions, transfer line vent conditions, and liquid sensor indications. The monitor panel monitors tank pressure and level in the storage area, S-IVB transfer line pressure and S-IVB filter differential pressure on the umbilical tower, and S-IVB tank and S-IVB vent pressure on the vehicle. The face layouts of the LH_2 control, components, and monitor panels are presented in figures 3-7, 3-8, and 3-9, respectively.

Control is provided for the LH_2 system in the LCC control panel for automatic loading, simulate, and manual arming. The simulate command executes automatic sequencing of the entire LH_2 tanking operation without actual transfer of LH_2. The simulate mode is exercised with the LH_2 shut off manually at the storage dewar. The manual arming command energizes a series of toggle switches in the components panel which permit any of the following actions:

a. Individual operation of any component in the LH_2 system
b. Operation of a series of components to execute any chosen sequence in the LH_2 tanking cycle
c. Capability of performing the entire LH_2 transfer operation manually
d. Manual operation of any component or sequence of components at any chosen point while in the automatic mode

Control commands from the LCC and status information exchange between the launch area, storage facility, and the LCC are transmitted by hardwire circuits.



NOTES

1. ENGRAVE PANEL PER MSFC-STD-275
2. PRIOR TO ASSEMBLY, FINISH PANEL PER MIL-STD-171 (ORD) FINISH NO. 4.3+7.3 (ELECTRICALLY CONDUCTIVE) AND PAINT PANEL FRONT AND EDGES ONLY PER SYSTEM NO. 21.9, COLOR NO. 26440 (GRAY) OF FED-STD-595
3. MASTER SPECIALTIES CO., GARDENA, CALIF. LEGENDS TO BE ENGRAVED BY VENDOR USING UPPER CASE ALT GOTHIC NO. 2 CHARACTERS .100±.010 HIGH.
4. CUTLER-HAMMER INC., MILWAUKEE, WISCONSIN.
5. MICRO-SWITCH CO., FREEPORT, ILLINOIS

Figure 3-7. Control Panel, LH_2 Electrical Control System

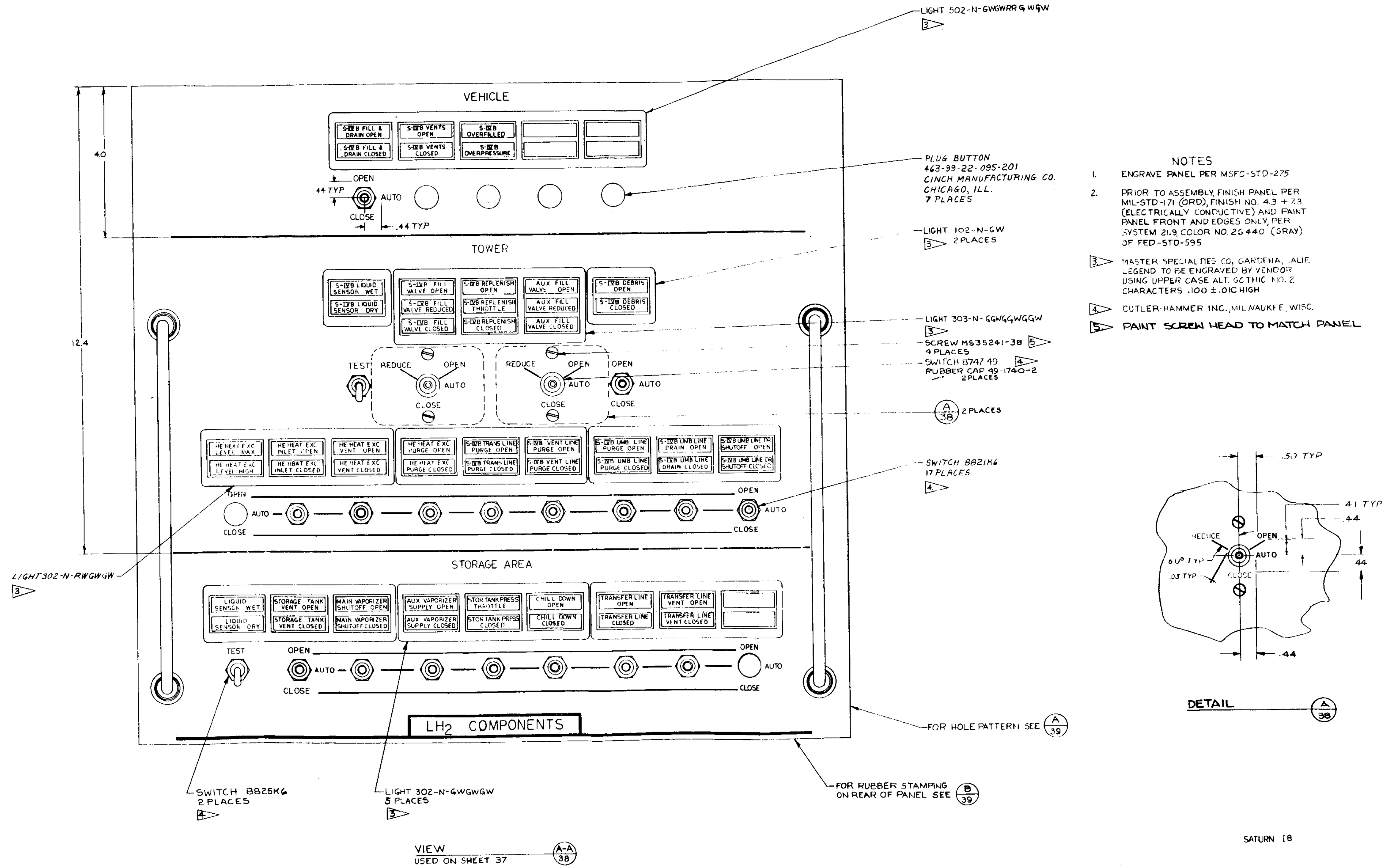


Figure 3-8. Components Panel, LH_2 Electrical Control System

To be supplied when available.

Figure 3-9. Monitor Panel, LH_2 Electrical Control System

The PTCS provides the signals during the automatic loading sequence which control and maintain the LH_2 level in the S-IVB propellant tank at 100-percent full or mission level. The propellant loading ground equipment test set is used for the LH_2 systems checkout.

The LH_2 loading sequence is as follows: provided that the LH_2 transfer system preparations have been completed and the system is operationally ready, the LH_2 fill command is executed and initiates the subsequent actions. Storage tank pressurization begins; when storage tank pressurization reaches 8 psig or higher, the transfer line and S-IVB fuel tank chilldown occurs until the transfer line temperature drops to minus $406^{\circ}F$ or lower. At minus $406^{\circ}F$ the initial S-IVB fill begins at a LH_2 flow rate of approximately 500 gpm. The 5-percent level signal initiates the fast fill sequence at the rate of approximately 2,500 gpm. The fast fill rate continues until the 93-percent level is reached, whereupon, the main fill valve is closed and the S-IVB slow fill resumes. A 10-minute interval is provided to allow stabilization of the LH_2 in the S-IVB during which the replenish valve is wide open, supplying LH_2 at a rate of approximately 250 gpm. At the end of the 10-minute interval, the S-IVB main fill valve is opened to the intermediate position, supplying LH_2 at a rate of approximately 500 gpm. Replenishing is maintained by interaction of the slow fill and the replenishing sequence until a signal from the PTCS terminates the sequence. After lift-off, the storage tank is vented and line drain is accomplished.

3-5. PROPELLANT TANKING COMPUTER SYSTEM

The PTCS designed for LC-34 controls the loading and replenishing of LOX, LH_2, and RP-1 aboard each Saturn IB vehicle. The PTCS for an individual propellant tank compares propellant level indication inputs from a mass sensing system aboard the vehicle with a reference standard and then adjusts the flow of propellant to meet predetermined vehicle requirements. This explanation of PTCS operation applies specifically to S-IVB LOX tank loading and S-IVB LH_2 tank loading. The operation of the PTCS being designed for the S-IB stage, though similar, will include certain differences which are noted later in this discussion.

The PTCS function begins with the energizing of a servo-driven potentiometer. The servo-driven potentiometer, which is mounted on the vehicle, is part of the propellant utilization system for the S-IVB LOX tank. The resultant (output) signal from the potentiometer varies with the propellant level. The output signal and a reference signal are fed to the PTCS where they are inserted into the automatic computer. (See figure 3-10.) In the automatic computer, the signals are filtered to minimize noise and then introduced to a summing network. In the summing network, the level signal is compared with the reference signal whose value is equivalent to a "100% Flight Mass" indication.

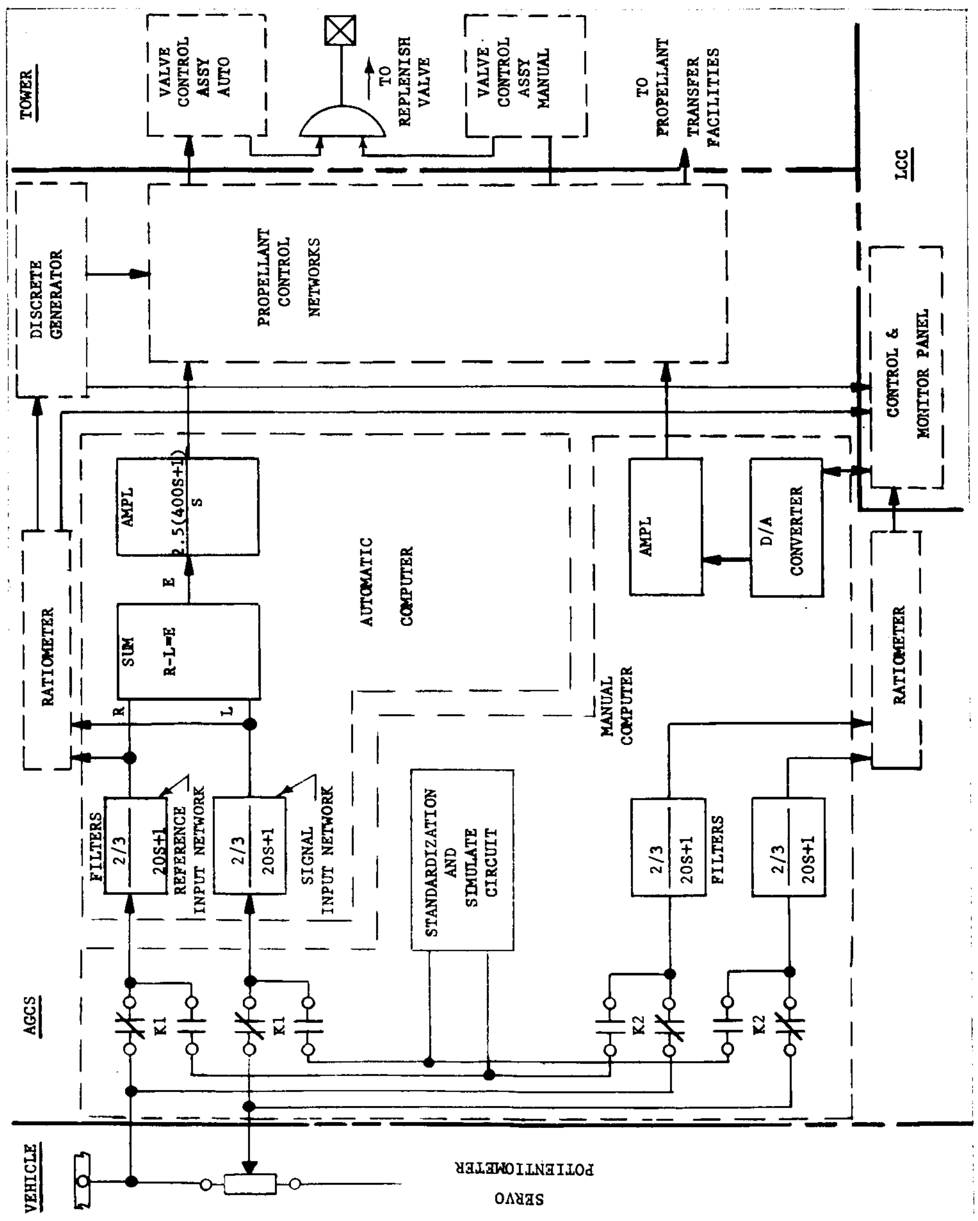


Figure 3-10. Signal Block Diagram, PTCS

The error (difference) between the two signals is then channelled through an amplifier and into the automatic valve control assembly. In the automatic valve control assembly, the electrical signal from the computer is converted into a pneumatic pressure which in turn controls the setting of the replenish valve.

The filtered signals are also fed into the ratiometer where they are converted into a digital signal with a numerical value equal in percent to the propellant mass in the tank. The digital signal from the ratiometer is then routed into the discrete generator where its numerical value is compared with preset discrete values which mark the following six specific points in the fueling cycle:

a. Start fast fill
b. Start cold GH_e load
c. Stop fast fill
d. Replenish normal
e. Stop slow fill
f. Flight mass - upper limits and lower limits

As each one of these specific points is reached, a circuit in the discrete generator is energized and transmits this information to the propellant control networks. An indicator on the control and monitor panel is also energized to display each point of the loading cycle that has been completed.

The digital signal from the ratiometer is also fed directly into the control and monitor panel. This panel, located in the LCC, displays the ratiometer signal as a 5-digit decimal number. The panel, shown in figure 3-11, provides readout displays for both the automatic and manual modes.

The automatic filling cycle for the propellant tanks, from chilldown to flight mass completion, is a precisely organized sequence of events. The points at which activities are started and terminated are related directly to the propellant level in the tanks; commands to the transfer facilities are initiated in the propellant control networks by discrete signals received from the discrete generators.

A simplified block diagram showing a complete PTCS and the location of its major units is presented in figure 3-12. The diagram also demonstrates the cable-sharing approach used to reduce overall cabling requirements.

Normal operation of the PTCS is fully automatic. Unless some malfunction occurs, the operator at the control console simply observes the propellant loading operations. The PTCS design, however, does include a complete manual system that is wired in parallel with the automatic system already discussed. The manual system provides an independent reference monitor during automatic operations and permits manual takeover at any point in the loading cycle.

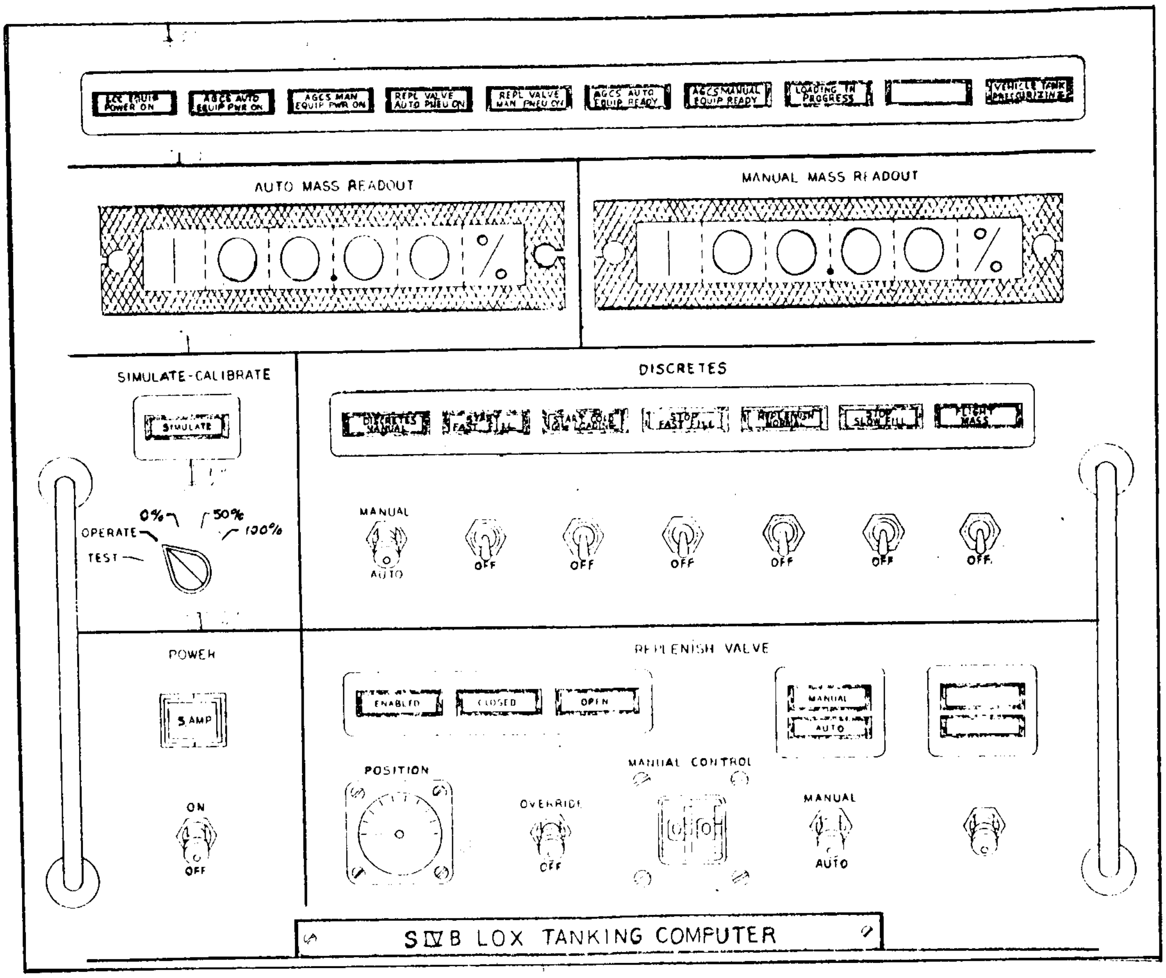


Figure 3-11. Control and Monitor Panel, PTCS

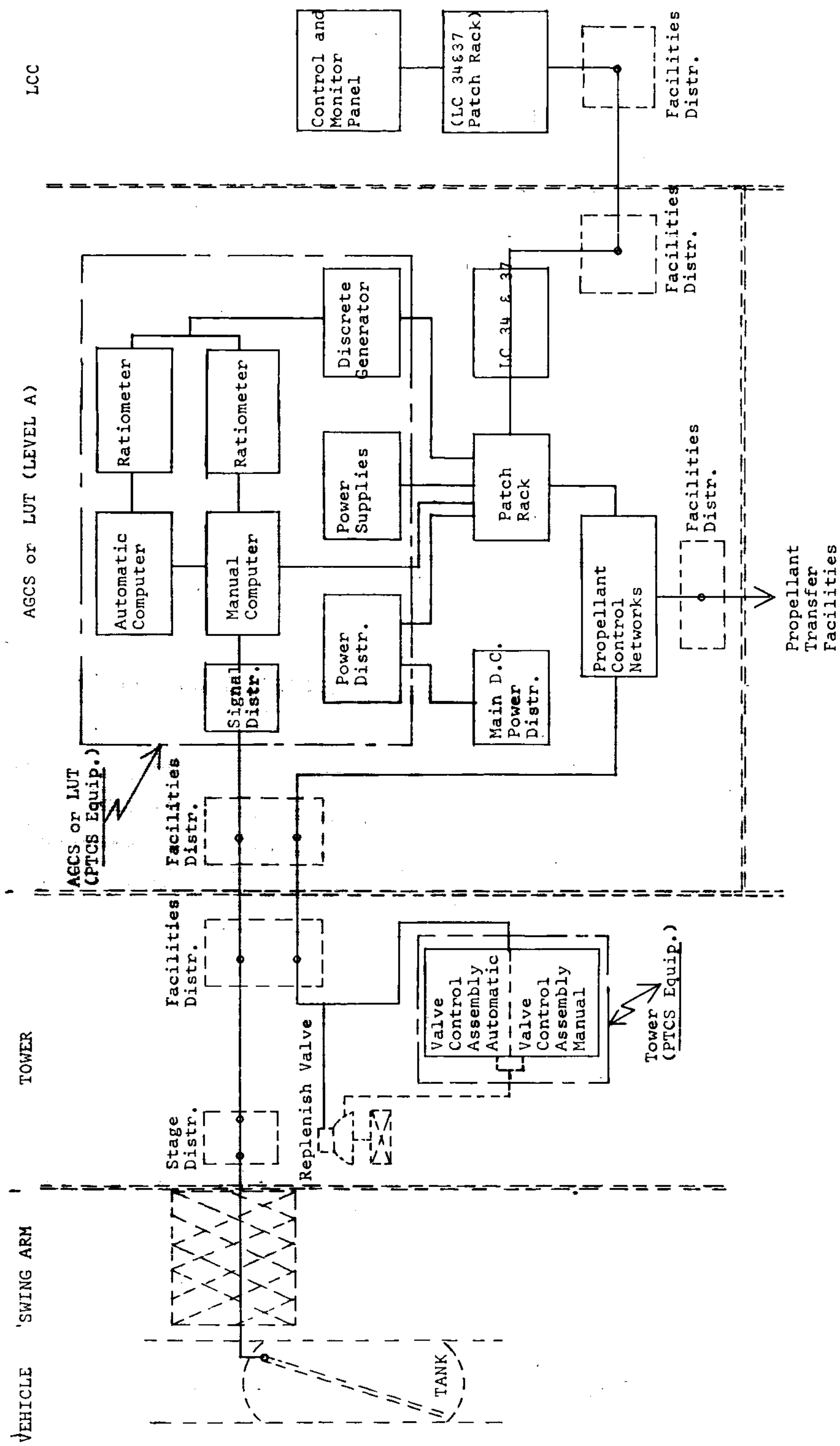


Figure 3-12. Block Diagram, PTCS

The manual computer also contains the equipment for checkout of the PTCS. A standardization and simulate circuit in the computer can be switched into the signal circuit to simulate the vehicle signals or to calibrate the readouts on the control and monitor panel. The simulate-calibrate controls are located on the control and monitor panel.

The signals from the vehicle, as described in the automatic operation, are fed through parallel filter networks into a ratiometer exactly as in the automatic system. The signals are converted into a digital signal and fed into the control and monitor for display on the manual readout portion of the panel.

Should any malfunction occur in the automatic channel, the operator can switch to manual mode on the panel and feed a controlled digital signal into a digital-analog converter. The analog output signal is then fed into an amplifier, and from the amplifier to the manual valve control assembly which is a duplicate of the unit in the automatic system. The manual valve control assembly, through a parallel pneumatic circuit, can also adjust the replenish valve to complete propellant loading. In addition, the operator can elect to introduce discrete signals into the propellant control networks by operating switches on the control and monitor panel. This permits the operator to provide manual substitution for the discrete generator.

All PTCS equipment is divided among the tower, AGCS, and LCC. (See figure 3-13.) Equipment in the tower is limited to the automatic and manual valve control assemblies, both of which are housed in a single cabinet. PTCS components installed in the AGCS are packaged into a single rack for each system. Equipment for each PTCS includes two ratiometers, two computers, the discrete generator, a power supply, and a power distributor. Equipment in the LCC will consist of one control and monitor panel. A typical control and monitor panel is shown in figure 3-11. It should be noted that some panel design details are not yet firm.

The two PTCS's for the S-IB LOX and RP-1 differ slightly from the two PTCS's for the S-IVB LOX and LH_2. (It should be remembered that the PTCS's for S-IVB LOX and LH_2 are essentially identical.) The PTCS's for S-IB differ in that they receive their level signals from continuous readout Δ P sensors rather than from capacitance probes. The signals from the Δ P sensors, therefore, require conditioning to change them to the proper value for the computers. A block diagram of the S-IB PTCS's is presented in figure 3-14. The PTCS's for the S-IB differ also in the adjust level drain. A RP-1 density correction factor will be supplied from a source outside the PTCS's.

3-6. CONVERTER COMPRESSOR

The converter-compressor facility comprises a 35,000-gallon storage

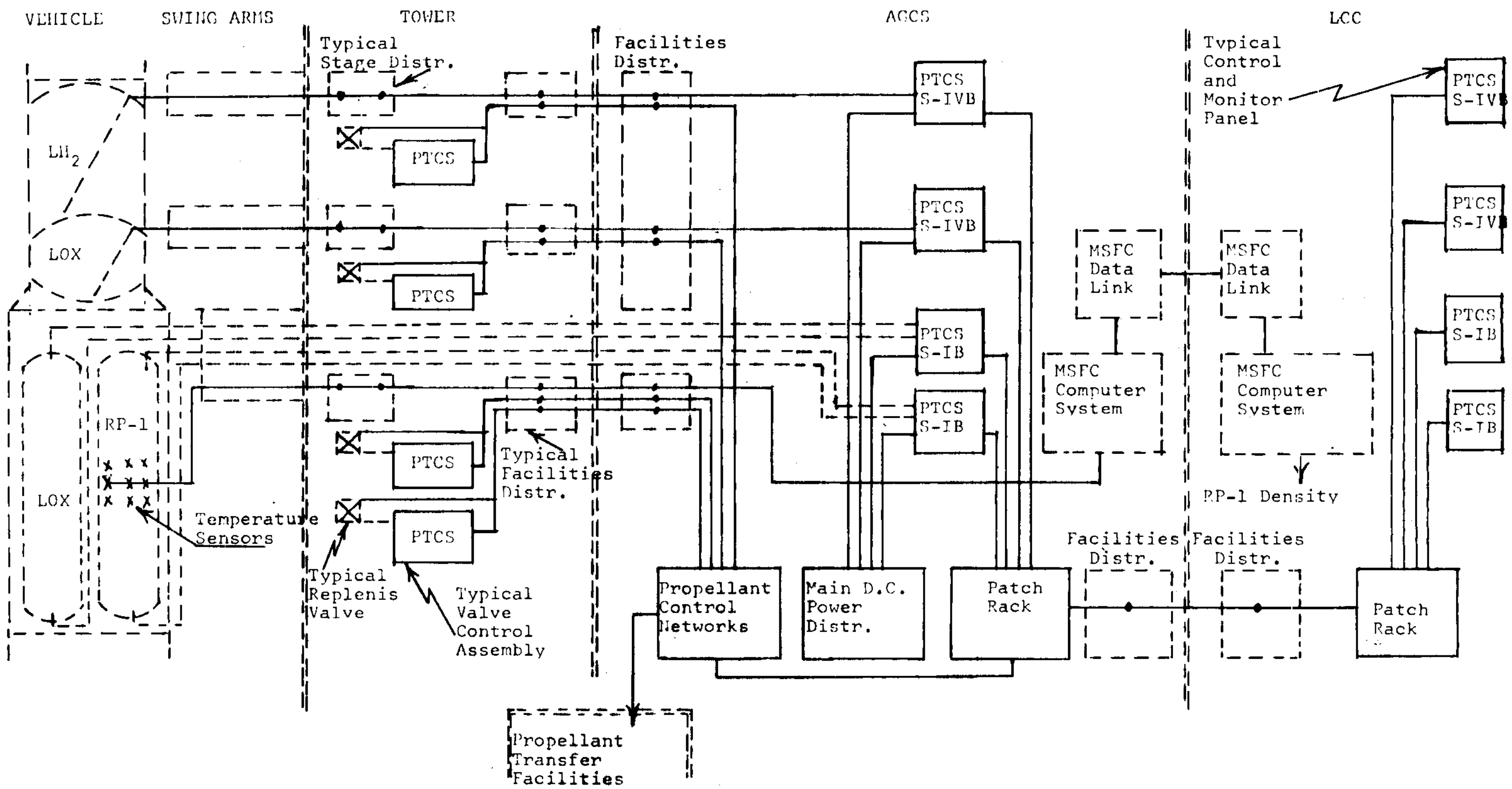
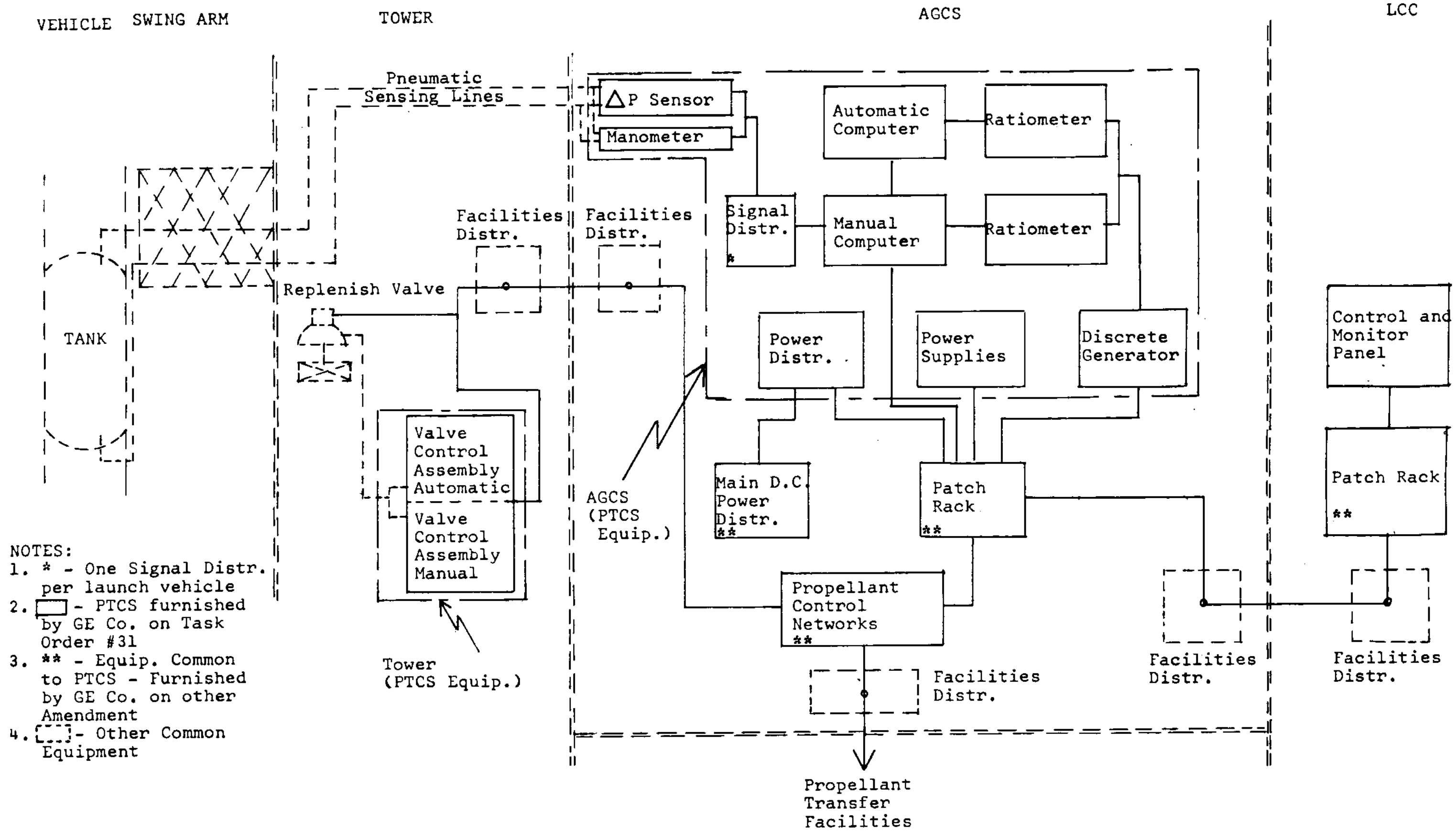


Figure 3-13. Block Diagram, PTCS, Typical for LC-34



NOTES:
1. * - One Signal Distr. per launch vehicle
2. [box] - PTCS furnished by GE Co. on Task Order #31
3. ** - Equip. Common to PTCS - Furnished by GE Co. on other Amendment
4. [dashed box] - Other Common Equipment

Figure 3-14. Block Diagram, S-IB PTCS

dewar, a tank vaporizer, four high-pressure liquid nitrogen (LN_2) pump and vaporizer units, three high-pressure H_e compressor units, two low-pressure LN_2 vaporizers (200-gpm), H_e dessicant units, a nitrogen gas drier and purifier, and associated equipment. The facility layout is presented in figure 3-15. The system layout is presented in figure 3-16.

The converter-compressor facility converts LN_2 to high-pressure GN_2. The high-pressure GN_2 is delivered at 6,000 psi to the high-pressure storage batteries at the launch pad. The high-pressure storage batteries supply the pneumatic system. GN_2 is supplied directly to the ECS at 45 psi.

GH_e is supplied to the compressors in the converter-compressor building from GH_e tube bank trailers. The GH_e pressure from the tube bank trailers is increased to 6,000 psi by the three helium compressors prior to delivery to the high-pressure storage batteries.

The LN_2 is converted to GN_2 in this system by means of the four pump vaporizer units. Electrical control of the system is centered on a control panel that is an integral part of a control cabinet mounted on the pumping unit assemblies.

The electrical system provides power for the 50-hp, ac pump motors, the 20-hp ac vaporizer blower motors, the 100-hp ac helium compressor motors, and the 30-hp, ac low-pressure vaporizer blower motors.

The electrical control and monitoring system layout showing the equipment locations and systems interconnect schematic for the LC-34 pneumatic system is presented in figure 3-17.

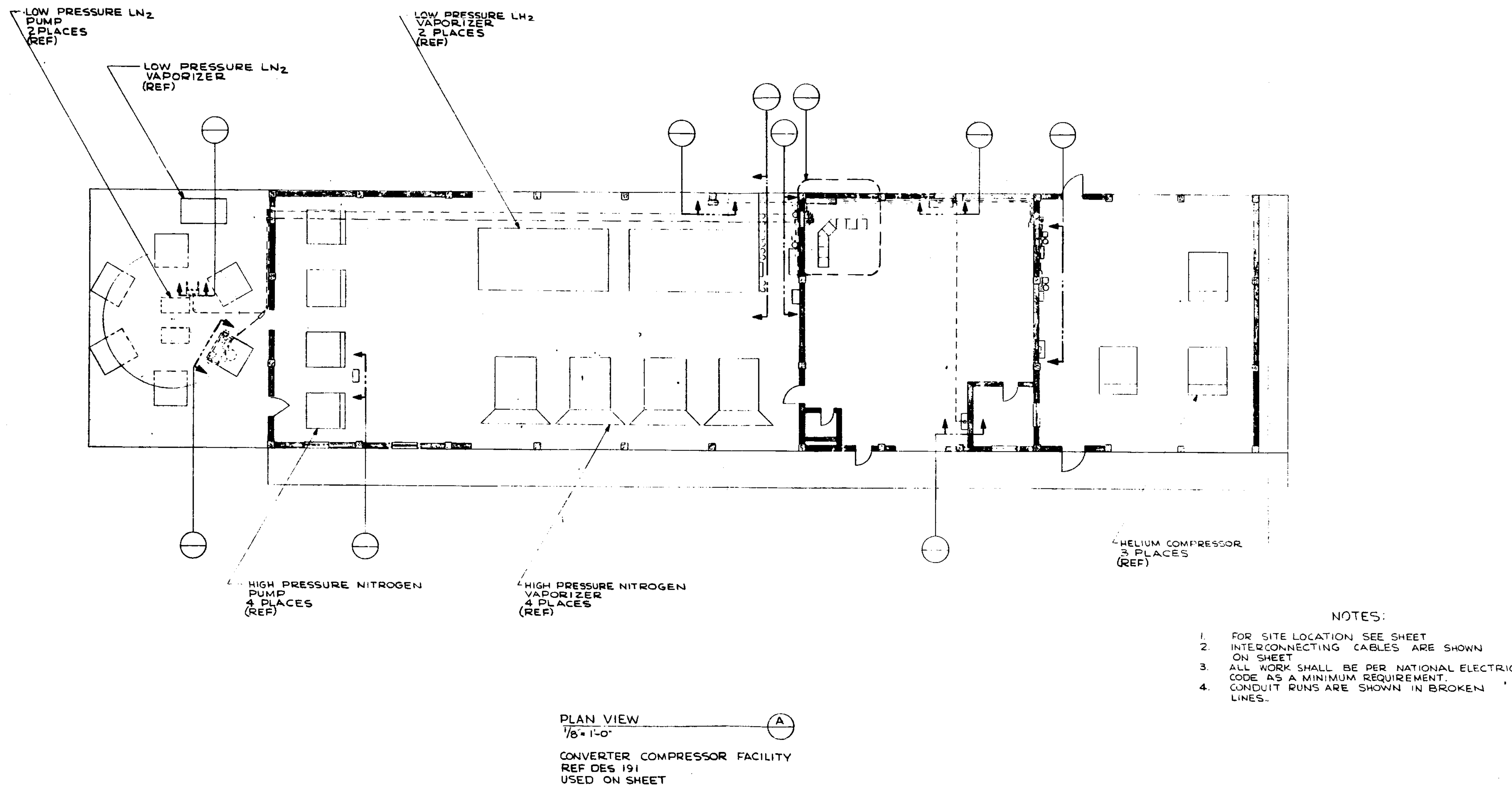


Figure 3-15. Facility Layout, Converter-Compressor

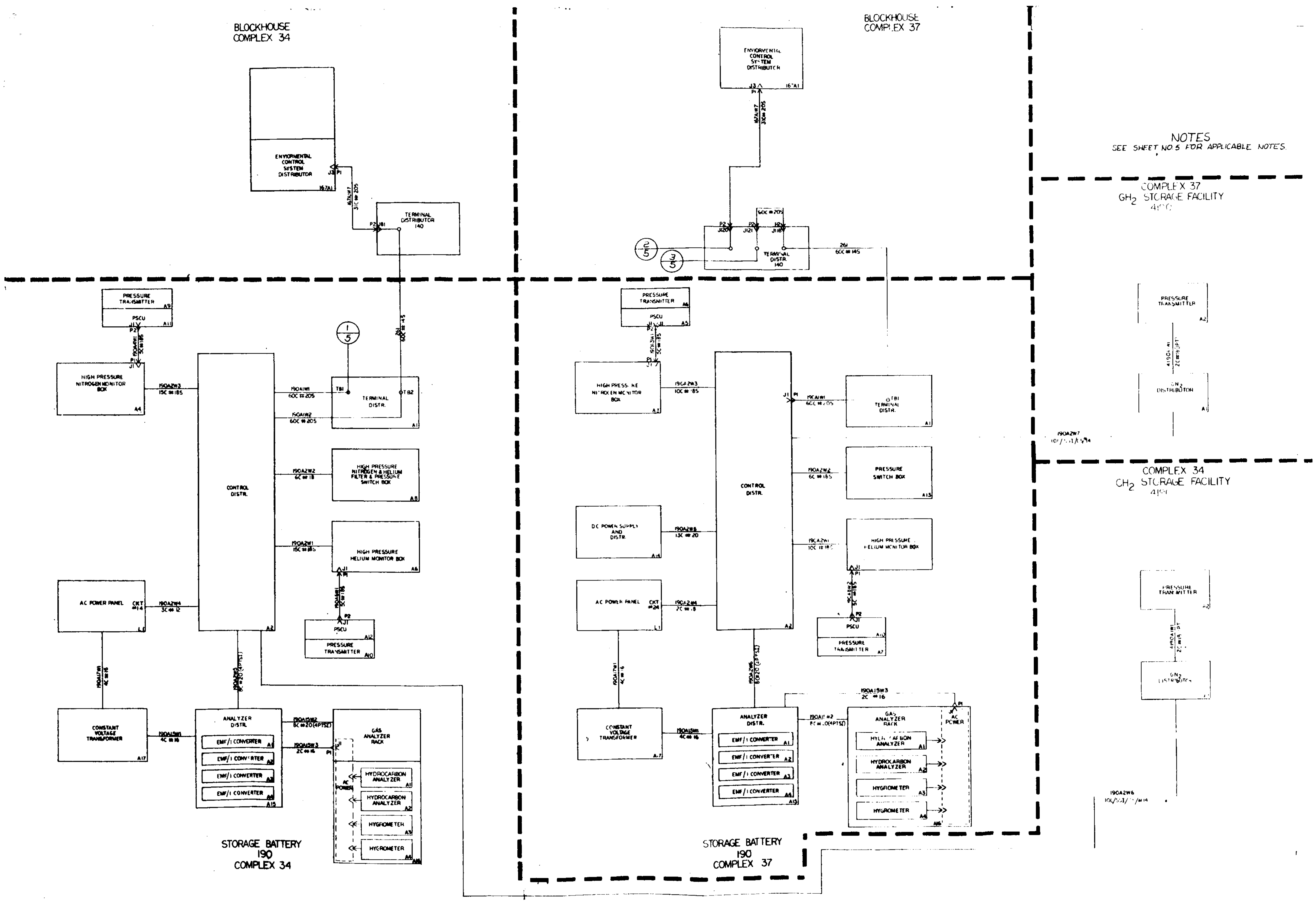


Figure 3-16. System Layout, Converter-Compressor

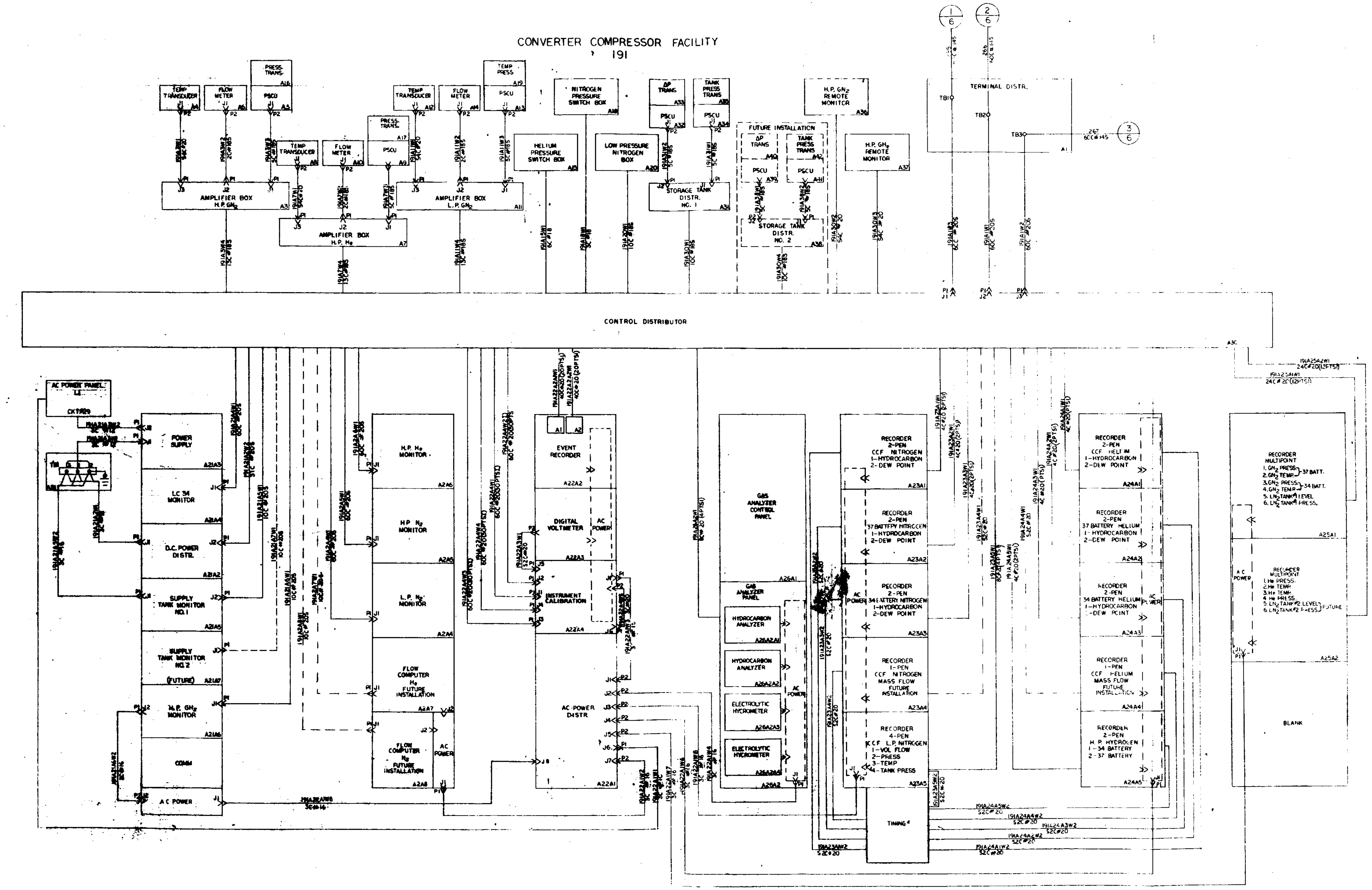


Figure 3-17. Electrical Control and Monitoring System, Converter-Compressor

SECTION IV
ENVIRONMENTAL CONTROL SYSTEM

The ECS is not presently defined. Information pertaining to the ECS will be presented at a later date.

SP-169-D

APPROVAL

SATURN IB ELECTRICAL GROUND SUPPORT EQUIPMENT FOR LAUNCH COMPLEX 34

APPROVALS:

H. D. Brewster
Technical Staff,
Launch Support Equipment
Engineering Division

T. A. Poppel
Director, Launch Support
Equipment Engineering
Division KSC